AN AIR-COOLED ELECTROCHEMICAL POWER GENERATOR

2008
RAMLI SITANGGANG
Chemical Engineering Department, FTI, UPN "Veteran" Yogyakarta.
Jl. SWK 104 Condongcatur, Yogyakarta, Indonesia, 55283

KARYA MONUMENTAL KEILMUAN ENERGI BARU TERBARUKN BIDANG TEKNOLOGI FUEL CELL

TECHNOLOGY PRODUCT YANG TIDAK DIPATENKAN

Petunjuk
Membuat rancangan dan karya teknologi yang tidak dipatenkan; rancangan dan karya seni monumental/seni pertunjukan; karya sastra;
Berdasarkan "Pedoman operasional penilaian angka kredit kenaikan pangkat/jabatan akademik dosen"
Direktorat jenderal pendidikan tinggi kementerian pendidikan dan kebudayaan tahun 2014

2001-2017
The ASEAN energy awards 2007 were awarded to energy projects in the ASEAN region that adopt best practices in energy efficiency and conservation, energy efficient buildings, renewable energy project, energy management in building and industry and excellence in energy management. The Fuel Cell Design and Prototyping Group within the Process System Engineering of Fuel Cells Research Group in the Institut Sel Fuel (The Institute of Fuel Cell), Universiti Kebangsaan Malaysia, lead by Prof. Ir. Dr. Hj. Wan Ramli Wan Daud, the Founder Director of the Institute, was awarded the Winner in the Special Submission Category in The 8th ASEAN Best Practices for Energy Efficient Buildings Competition for their entry, Small-Scale Portable Fuel Cell Power at Universiti Kebangsaan Malaysia during the ASEAN Energy Awards Night gala dinner on the 23rd of August 2007 at the Shangri-La Hotel Singapore. The special submission category refers to special projects which study, apply and/or develop innovative use of technologies (including R&D projects) which could be applied to reduce energy consumption in buildings. The aim is to promote the development of innovative energy efficiency-related solutions together with ASEAN wisdom. The award consists of a plaque and a certificate. Members of the Winning Fuel Cell Design and Prototyping Group are: Prof. Ir. Dr. Hj. Wan Ramli Wan Daud, Prof. Dr. Hj. Jaafar Sahari, Prof. Dr. Hj. Abu Bakar Mohammad, Prof. Dr. Kamaruzzaman Sopian, Prof. Dr. Abdul Amir Hassan Kadhum, Prof. Dr. Che Hassan Che Haron, En. Masli Irwan Rosli, En. Shahbudin Mastor, Dr. Edy Herianto, Dr. Ramli Sitanggang and En. T. Husaini. The awards could not have been won without the great help and support of the supporting staff of the Institut Sel Fuel, Cik Norly Ishak and En. Amil Fadzillah Haron and other research groups at the Institute.
An Air-Cooled Electrochemical Power Generator

Abstract

The present invention relates to an electrochemical power generator, comprising: a) a casing (51); b) a plurality of fuel cell stacks (52) each having a plurality of anodes (57) and cathodes (58), assembled within the casing (51); c) a ventilating means (53) coupled with each of the fuel cell stacks (52) for supplying air to the cathodes (58) as well as for cooling the fuel cell stacks (52); d) a hydrogen feed (54) for conveying hydrogen gas to the anodes (57) to react with the air and generating electrochemical energy at the fuel cell stacks (52); and e) a current converter (55) for converting direct current (DC) to alternating current (AC) to supply energy to an electrical load (56).

The most illustrative drawing:
## METODE PENILAIAN

Instrument untuk mengukur kualitas pembuatan dan penerapan teknologi. Pada umumnya Tim Penilai permateri/perfomance menjalani karya teknologi dengan cara membentuk karya penyaluran teknologi dengan karya yang lain, penilaian karya teknologi dilakukan yang sangat penting pada produk penjualan yang sangat penting pada produk penjualan untuk pengembangan P3M/... sumberan utama untuk karya penjualan.

## MILAI BERASA
- Sertifikat Lembaga: Sederhana (Medali Perunggu)
- Tinjauan (Medali Perak)
- Cermat (Medali Perak)
- Tidak
- Cerminan
- Penghargaan Terbaik dari seluruh Innovation Technology di Usut

## ANTISERAH ISTIMEWA

## TOR PRODUK TEKNOLOGI

<table>
<thead>
<tr>
<th>Bidang Keilmuan</th>
<th>Energi baru terbarukan bidang Teknologi Fuel Cell</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program</td>
<td>Membuat rancangan dan karya teknologi yang tidak dipatkan; rancangan dan karya seni monumental/seri pertunjukan; karya sastra Apilisasi Sain Fuel Cell</td>
</tr>
<tr>
<td>Output Program</td>
<td>PROTOTIPE PORTABLE POWER GENERATOR DIRECT METHANOL</td>
</tr>
<tr>
<td>Materi Pameran</td>
<td>Design Advisor tool for Direct Methanol Fuel Cell (MDFC), Portable Fuel Cell Power Generator Direct Methanol Fuel Cell</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Acknowledgement</td>
<td>The financial support from the Malaysian Ministry of Science, Technology and Environment, through IRPA Project 08-02-02-0020 is much appreciated.</td>
</tr>
<tr>
<td>Tingkat Pameran</td>
<td>INTERNATIONAL MTE, Event organizer (2008)</td>
</tr>
<tr>
<td>Output Pameran (Penilaian)</td>
<td>SILVER MEDAL</td>
</tr>
<tr>
<td>Indikator Kinerja Kegiatan</td>
<td>Jumlah Pameran /pertunjukan demostrasi Produk Teknologi</td>
</tr>
<tr>
<td>Jumlah Pameran (Output)</td>
<td>1</td>
</tr>
<tr>
<td>Kode Penilaian</td>
<td>I.E.1</td>
</tr>
<tr>
<td>Bukti Kinerja</td>
<td>1 SERTIFIKAT Review</td>
</tr>
<tr>
<td><strong>Kredit Paling Tinggi</strong></td>
<td>20</td>
</tr>
<tr>
<td>Usulan Nilai PORTABLE POWER GENERATOR DIRECT METHANOL FUEL CELL (MDFC)</td>
<td>20</td>
</tr>
<tr>
<td>Alamat teknologi</td>
<td>Institut Fuel Cell UKM</td>
</tr>
<tr>
<td>Reviever Curriculum Vite terlampir</td>
<td>• PROF. IR. DR. HJ. WAN RAMLJ WAN DAUD</td>
</tr>
<tr>
<td></td>
<td>• Department of chemical &amp; process engineering, Faculty of Engineering, Universiti Kebangsaan Malaysia, 43600UKM Bangi, Selangor Darul Ehsan, Tel: 03-8921 6412 fax: 03-8921 6148</td>
</tr>
</tbody>
</table>
**Title:**

**PROTOTIPE**

**AN AIR-COOLED ELECTROCHEMICAL POWER GENERATOR**

Ramlit Sitanggang  
Department of Chemical Engineering, FTI, UPN "Veteran", Yogyakarta, Indonesia, 55283

---

<table>
<thead>
<tr>
<th>Date</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PROF. IR. DR. HJ. WAN RAMLI WAN DAUD</td>
</tr>
<tr>
<td></td>
<td>Department of chemical &amp; process engineering, Faculty of Engineering, Universiti Kebangsaan Malaysia, 43600UKM Bangi, Selangor Darul Ehsan,</td>
</tr>
<tr>
<td></td>
<td>Tel: 03-8921 6412  fax: 03-8921 6148</td>
</tr>
</tbody>
</table>

**Content**

**FIELD OF TECHNOLOGY**
**BACKGROUND OF THE TECHNOLOGY**
**SUMMARY OF TECHNOLOGY /PRINCIPLES OF TECHNOLOGY**
**BRIEF DESCRIPTION OF THE DRAWINGS/SPECIFICATION**
**DETAILED DESCRIPTION OF THE TECHNOLOGY**

**FIELD OF TECHNOLOGY**

The present invention relates to an electrochemical power generator. In more particular, the present invention relates to a portable air-cooled system of polymer electrolyte membrane fuel cell (PEMFC) capable of generating an electrical energy which is applicable for the use of power generation in various applications.
BACKGROUND OF THE TECHNOLOGY

As fossil fuel is depleted in the near future, hydrogen will be the most viable alternative fuel because it is clean and renewable. Fuelled by pure hydrogen, fuel cells produce only pure water as exhaust. Even when powered by fossil fuels, they produce far less pollution than conventional technologies. Releasing the energy in a fuel through high-temperature combustion, as in an internal combustion engine, results in the creation of polluting nitrogenous and sulphurous oxides.

Fuel cells are electrochemical devices that produce electricity at high efficiency without combustion. They extract more energy from a fuel due to the increase in the efficiency of electrochemical conversion over combustion. Since there are no moving parts in a fuel cell stack, there are no mechanical inefficiencies encountered. Without moving parts, fuel cell stacks are therefore silent and vibration-free. The PEMFC is the preferred hydrogen fuel power plant for portable and stationary generator. It is also the most viable and sustainable alternative to the internal combustion engine as the power generating system for the future. PEMFC can be used in many applications, including road vehicles, small-scale power stations and possibly even portable electronics.

There are some inventions disclosed in the prior arts pertaining a power generating system of a fuel cells. The different types of configuration in a fuel cell system including the designs of multi layer membrane electrode assembly (MEA) stacks, the materials used to fabricate the bipolar plates, flow fields and membranes in a PEMFC have resulted in the difference of the fuel cells' efficiencies in generating electrical energy.

Of interest in connection with a self-inerting fuel cell system is U. S. Patent No. US6127057. This fuel cell system comprises a first fine pore plate positioned at an anode side of an MEA, a second fine pore plate positioned at a cathode side of an MEA, means for driving fuel reactant flow, oxidant reactant flow and coolant flow, respectively, and a controller for activating or deactivating the flows during fuel cell operation. This system requires a coolant to manage the heat produced by the fuel cell stack.

Another invention disclosed in U. S. Patent No. US2005042493 also relates to a fuel cell device. This simple fuel cell device includes a plurality of cells which are vertically stacked, a first manifold for fuel feeding, a second manifold for fuel discharging and an outlet for the fuel provided in the upper part of the second manifold. The fuel employed in this invention is preferably methanol and not hydrogen. There is also another invention relating to a fuel cell and fuel cell system disclosed in U. S. Patent No. US2007072051. This system contains a MEA stack which is coupled with a fan for supplying oxygen into the MEA stack. However, this invention applies direct methanol fuel cell (DMFC) system instead of PEMFC system.

A forced air fuel cell power system is disclosed in U. S. Patent No. US7241523. This fuel cell system includes a fuel cell stack, fuel storage container as well as an air moving device configured to direct atmospheric air towards the fuel cell stack. However, this small device is merely suitable to be used for replacing batteries in electrical appliances such as video cameras, laptop computers and cell phones. A wide variation of fuel cell power generators has been described by the prior arts, however the efficiencies of their electrical energy generating system are yet to be
improved. As the heat generated by the PEMFC fuel cell during fuel cell operation affects the efficiency of the system, it is preferable for the present invention to develop a fuel cell system which is facilitated with a better stack cooling or heat management system. Besides, it is also desirable for the present invention to develop a highly efficient electrochemical power generator which is also clean, silent and environmentally friendly by using only pure hydrogen as fuel. Meanwhile, the electrochemical power generator is preferably low in production cost, having a quick start-up property as well as having easy maintenance.

SUMMARY OF TECHNOLOGY /PRINCIPLES OF TECHNOLOGY

The primary object of the present invention is to develop a portable and compact power generator of PEMFC as electrical power source for various applications, which integrates the fuel cell stacks with stack cooling system and control system in order to achieve higher efficiencies of the PEMFC configured therein. Another object of the present invention is to develop a power generator which possesses innovative MEA design, incorporated with a dual-functioning air handling concept wherein air is directed to the fuel cell stacks to react with the fuel for energy generation as well as to cool the fuel cell stack. Yet another object of the present invention is to provide a portable 1000W fuel cell system back-up generator designed for indoor as well as outdoor application.

Still another object of the present invention is to provide a power generator which produces clean electrical power without emitting air pollutants and green house gases to meet the global challenge in research and development for environmentally friendly power sources.

Further object of the present invention is to provide an electrical power generating system which is capable of generating pure, high-quality electrical power continuously without having to stop for recharging.

At least one of the preceding objects is met, in whole or in part, by the present invention, in which the first embodiment of the present invention describes an electrochemical power generator, comprising: a) a casing (51); b) a plurality of fuel cell stacks (52) each having a plurality of anodes (57) and cathodes (58), assembled within the casing (51); c) a ventilating means (53) coupled with each of the fuel cell stacks (52) for supplying air to the cathodes (58) as well as for cooling the fuel cell stacks (52); d) a hydrogen feed (54) for conveying hydrogen gas to the anodes (57) to react with the air and generating electrochemical energy at the fuel cell stacks (52); and e) a current converter (55) for converting direct current (DC) to alternating current (AC) to supply energy to an electrical load (56).

The second embodiment of the present invention is an electrochemical power generator disclosed by the first embodiment which further comprises a filtering means (59) in between each ventilating means (53) and each fuel cell stack (52) for filtering the air before it is supplied to the cathodes (58). Another embodiment of the present invention is an electrochemical power generator disclosed by the first and the second embodiment which further comprises a pressure regulating means (60, 64) and a flowrate controlling means (61, 62) connected to the fuel cell stacks (52).
In another preferred embodiment of the present invention, each of the fuel cell stacks (52) of the electrochemical power generator comprises a plurality of membrane electrode assemblies (MEA) (63) that are sandwiched between a plurality of bipolar plates and sealed by a plurality of gaskets. Preferably, the membrane electrode assemblies (MEA) (63) comprises a sandwich including a polymer membrane between two catalytic electrodes which is itself sandwiched between two gas diffusion layers.

Still another preferred embodiment of the present invention discloses an electrochemical power generator, wherein the ventilating means (55) is a fan. The 1000kW power generator disclosed is a portable fuel cell back-up generator designed for indoor or outdoor operations. It can be used for commercial, industrial or residential applications and especially suitable for outdoor applications. It is environmentally friendly, simple to use, quiet and compact. One skilled in the art will readily appreciate that the present invention is well adapted to carry out the objects and obtain the ends and advantages mentioned, as well as those inherent therein. The embodiments described herein are not intended as limitations on the scope of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS/SPECIFICATION

For the purpose of facilitating an understanding of the invention, there is illustrated in the accompanying drawing the preferred embodiments from an inspection of which when considered in connection with the following description, the invention, its construction and operation and many of its advantages would be readily understood and appreciated.

![Diagram](image-url)

Figure 1 is a schematic diagram of the air-cooled electrochemical power generator embodied by the present invention.
DETAILED DESCRIPTION OF THE TECHNOLOGY

The present invention relates to an electrochemical power generator. In more particular, the present invention relates to a portable air-cooled system of polymer electrolyte membrane fuel cell (PEMFC) capable of generating an electrical energy which is applicable for the use of power generation in various applications. Hereinafter, the invention shall be described according to the preferred embodiments of the present invention and by referring to the accompanying description and drawings. However, it is to be understood that the description to the preferred embodiments of the invention and to the drawings is merely to facilitate discussion of the present invention and it is envisioned that those skilled in the art may devise various modifications without departing from the scope of the appended claim.

The present invention discloses an electrochemical power generator, comprising: a) a casing (51); b) a plurality of fuel cell stacks (52) each having a plurality of anodes (57) and cathodes (58), assembled within the casing (51); c) a ventilating means (53) coupled with each of the fuel cell stacks (52) for supplying air to the cathodes (58) as well as for cooling the fuel cell stacks (52); d) a hydrogen feed (54) for conveying hydrogen gas to the anodes (57) to react with the air and generating electrochemical energy at the fuel cell stacks (52); and e) a current converter (55) for converting direct current (DC) to alternating current (AC) to supply energy to an electrical load (56). As illustrated in Figure 1, the electrochemical power generator invented integrates the innovation of a high-performance fuel cell stacks (52) with a dual-functioning air handling concept for directing air to the fuel cell stacks (52) to react with fuel for energy generation, as well as distributing air throughout the fuel cell stacks (52) for stack cooling effect.

According to one of the embodiment of the present invention, the air-cooled electrochemical power generator disclosed is housed in a casing (51) which is preferably designed in a dimension of 53cm x 22cm x 56cm. The casing (51) can be made of any suitable materials, such as aluminium, steel, plastic or others. The power generator invented has a weight range of approximately 8.0kg to 10.0kg. In the present invention, PEMFC is used as the type of fuel cell and hydrogen gas is applied as the fuel. With a supply pressure of 1.5 bar to 3.0 bar, the electrochemical power generator of the present invention consumes approximately 15 to 20 standard liter per minute. As a result, a total power output of 1000Watt can be generated by this power generator.

This air-cooled power generator disclosed is a portable fuel cell back-up generator especially designed for outdoor operations. However, it can also be used for indoor activities. It applications include commercial, industrial or residential usage. It is environmentally friendly, simple to use, quiet and compact. Owing to its portable and convenient properties, this power generator is suitable for the use as an electrical power source for a small room, power generator for night market and others. As set forth in the preceding description, the power generator disclosed comprises significant components which are a plurality of polymer electrolyte membrane fuel cell (PEMFC) stacks (52) with open-air cathodes (58). The plurality of fuel cell stacks (52) are configured within the casing (51) and connected among each others. Each of the fuel cell stacks (52) has a plurality of cathodes (58) and anodes (57) for generating electrochemical energy. According to the preferred embodiment of the present invention, there are two fuel cell stacks (52) configured in this air-cooled power generator.
generator, as shown in Figure 1. Each fuel cell stack (52) provides 500Watt of power output. As a result, a total power output of 1000Watt can be generated by this power generator as described in the foregoing description.

In accordance with the preferred embodiment of the present invention, the electrochemical power generator is characterized by a ventilating means (53) which is coupled with each of the fuel cell stacks (52) for supplying air to the cathodes (58) as well as for cooling the fuel cell stacks (52). This characteristic is named the dual-functioning air handling concept. Preferably, the ventilating means (53) is a fan. As set forth in the preceding description, the air-cooled power generator disclosed comprises two open-air PEMFC stacks (52). The open cathode (58) channel is designed to supply air directly from the atmosphere so as to supply the oxygen to the fuel cell stack (52) without using a pump, which indirectly reduces peripheral equipment cost. This air-cooling system also cools the PEMFC stacks (52) thus removing the need for a water-cooling system.

During the generation of electrochemical energy, the fuel cell stacks (52) tend to be heated up. The dual-functioning air handling concept is capable of maintaining the oxygen supplied to cool the stack (52) as well as to remove the water produced by the electrochemical reaction occurred therein.

In one of the preferred embodiment of the present invention, the power generator further comprises a filtering means (59) in between each ventilating means (53) and each fuel cell stack (52) for filtering the air before it is supplied to the anodes (57), as illustrated in Figure 1. As the power generator is used in tropical regions, air from the atmosphere is humidified. Therefore, the polymer electrolyte membrane in the fuel cell stack (52) can be kept moist in order to ensure high proton flux across the membrane electrode assemblies (MEA) (63) which will keep the PEMFC current and power high.

This air-cooled power generator is fueled by hydrogen gas. According to the preferred embodiment of the present invention, the power generator comprises a hydrogen feed (54) which conveys hydrogen gas to the anodes (57) of the fuel cell stacks (52). The hydrogen can be supplied externally through stand-alone industrial cylinders when the power generator is designed for commercial and industrial use, or internally within the casing (51), through easy-to-use mini cylinder when the power generator is customized for commercial and residential use.

As set forth in the foregoing description, electrical energy will be generated by the electrochemical power generator as the cathodes (58) of the fuel cell stacks (52) receiving the humidified air from atmosphere while the anodes (57) of the fuel cell stacks (52) receiving hydrogen from a hydrogen feed (54). The hydrogen is catalytically oxidized in the MEA (63) and split into protons and electrons. While the protons are allowed to permeate through the polymer membrane of MEA (63) from anodes (57) to the cathodes (58), electrons travel along an external circuit to the cathode (58), generating a flow of electrons producing electrical current for powering an external circuit. In the meantime, humidified air (oxygen) passes through the gas diffusion layer of the MEA into the cathodes (58) and reacts with the protons from the polymer membrane and the electrons from the external circuit to form water molecules. The direct current (DC) created is converted to alternating current (AC) by an current converter (55) and the electrical energy is supplied to an electrical load (56) for the use of suitable electrical appliances. As described in the preceding description, the power generated is up to 1000Watt (1kW) when two fuel cell stacks (52) are installed.

Further embodiment is an electrochemical power generator which further comprises a pressure regulating means (60, 64) and a flowrate controlling means (61, 62)
connected to the fuel cell stacks (52). As illustrated in Figure 1, the pressure regulating means (60, 64) can be a combination of a pressure regulator (64) and a pressure gauge (60) which is used for controlling the pressure in the hydrogen feed (54). According to the preferred embodiment, hydrogen gas is maintained at a high pressure hydrogen feed in a pressure range of 100MPa to 360MPa. It is fed to the PEMFC stack at 150 kPa to 250 kPa for better hydrogen utilization. The flowrate controlling means (61, 62) which preferably comprises a metering valve (61) and a flowmeter (62) can be used for controlling flowrate of the hydrogen gas supply.

The ventilating means (53) or the fan coupled with each fuel cell stack (52) is equipped with a motor in order to move the atmospheric air efficiently for better oxygen distribution throughout the plurality of fuel cell stacks (52). As high temperature will affect the performance of the power generating system, the plurality of fuel cell stacks (52) must be cooled by a stack cooling system. With the dual-functioning air-handling concept, the present invention removes the need for a pump for distributing air to achieve stack cooling effect. The configuration and design of the MEA (63) is vital in determining the effectiveness of an PEMFC. According to one of the preferred embodiments of the present invention, each of the MEAs (63) described in the preceding description comprises a sandwich having a polymer membrane between two catalytic electrodes which is itself sandwiched between two gas diffusion layers. Preferably, the high performance MEAs (63) are designed as five-layer assemblies. The catalytic electrodes attached on both sides of the polymer electrolyte membrane are made by spray coating proprietary platinum-activated carbon catalyst ink whereas the gas diffusion layers are made from carbon cloth coated with proprietary hydrophobic layer. According to one of the preferred embodiments of the present invention, the fuel cell stack (52) comprises a plurality of MEAs (63) that are sandwiched between a plurality of composite bipolar plates by the application of pressure on an external device. The bipolar plates and the MEAs (63) are then sealed by a plurality of gaskets. Preferably, the number of MEAs (63) configured for each fuel cell stack (52) of the present invention is 50 to 80. In a preferred embodiment, with each MEA (63) provides a voltage of 0.6V, a 48V of direct current (DC) and a 220V alternating current (AC) are therefore obtained by the fuel cell stacks (52) with 80 MEAs. The DC-AC inversion is performed by a commercially obtained by the current converter (55) which converts DC to AC so as to supply energy to the electrical load (56). According to the preferred embodiment of the present invention, this electrical load (56) can be the electrical circuit of outdoor or indoor electrical appliances. Preferably, the bipolar plates applied to sandwich the MEAs (63) is in a number of 51 to 81 plates and the gaskets used for sealing the MEAs is in a number of 50 to 80 layers. Preferably, the gaskets are made of silicone rubber. The bipolar plates are preferably made of a proprietary polymer composite material and are constructed by using a computer numerical control (CNC) milling machine. According to the preferred embodiment, each bipolar plate has serpentine flow fields on both sides whose shapes and dimensions are optimized for low pressure drop and uniform distribution of gas on the electrodes.

The air-cooled power generator is environmentally friendly, simple to use, quiet and compact. It is low in production cost, having a quick start-up property as well as having easy maintenance. The overall efficiency of the system can reach up to 75%. The present disclosure includes as contained in the appended claims, as well as that of the foregoing description. Although this invention has been described in its preferred form with a degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and the combination and arrangements of parts may be resorted to without departing from the scope of the invention.
Reviewer

BIODATA

Name: PROF. DATO’ IR. DR. WAN RAMLI BIN WAN DAUD
Date of Birth: 27th December 1955
Designation: Founding Director, Fuel Cell Institute UKM (2007-2013) 
Professor of Chemical Engineering (since 1996)
Address 1: Fuel Cell Institute
Universiti Kebangsaan Malaysia
43600 UKM Bangi, Selangor
MALAYSIA
Tel.: 03-89118418 019-3876267
Fax: 03-89218530
Address 2: Department of Chemical & Process Engineering
Faculty of Engineering & Built Environment
Universiti Kebangsaan Malaysia
43600 UKM Bangi, Selangor
MALAYSIA
Tel.: 03-89118418
Fax: 03-89216148
E-mail: wramli@eng.ukm.my; wramli@gmail.com

Order of Chivalry:
• Darjah Setia Pangkuan Negeri (D.S.P.N.) which carries the title Dato’ from the Pulau Pinang State Government, Malaysia conferred on 28 August 2013.

Fellowship of Academy of Science:
• Elected Fellow of Academy of Science, Malaysia on 27 April 2012.

Academic & Professional Qualification:
• BEng (First Class Honours), Monash University, Victoria, Australia in Chemical Engineering 1978
• PhD, University of Cambridge, United Kingdom in Chemical Engineering 1984
• Professional Engineer(Chemical Engineering), Board of Engineers Malaysia (Registration No.: 8561) (1996-now)
• Chartered Chemical Engineer, Institution of Chemical Engineers, United Kingdom and The Engineering Council, United Kingdom (Registration No: 564829) (2007-now)

Academic Career:
• Tutor, Department of Chemical Technology, Faculty of Physical and Applied Sciences, Universiti Kebangsaan Malaysia (1979-1984)
• Lecturer, Department of Chemical & Process Engineering, Faculty of Engineering, Universiti Kebangsaan Malaysia (1984-1989)
• Head, Department of Chemical & Process Engineering, Universiti Kebangsaan Malaysia (1984-1988)
• Associate Professor, Department of Chemical & Process Engineering, Faculty of Engineering, Universiti Kebangsaan Malaysia (1989-1996)
- Professor of Chemical Engineering, Department of Chemical & Process Engineering, Faculty of Engineering, Universiti Kebangsaan Malaysia (1996–)
- Coordinator, MEng (Chemical Engineering) by course work, Department of Chemical & Process Engineering, Faculty of Engineering, Universiti Kebangsaan Malaysia (2000-2006).
- Founding Director, Fuel Cell Institute, Universiti Kebangsaan Malaysia (2007-2013)

1. Awards and Recognition:

a. International Awards

- One out of 3 Malaysians Listed in the World’s Most Influential Scientific Mind 2015 by Thomson Reuters.
- Won Award for Excellence in Research in Drying of Agricultural Products and Outstanding Contribution to the Development of Drying Technology 2011
- Won Outstanding Contribution to the Drying Community Award 2009
- Won IChemE Highly Commended Shell Energy Award 2008
- Won 2 gold medals in Brussels 2007 and 2 gold medals in Geneva 2001 and 2005 respectively
- Won ASEAN Energy Awards in Singapore 2007 and in Phnom Penh 2005 respectively
- Won 2 bronze medals in Brussels 2007
- Won special award of Environmental Protection Society of Switzerland in 2001 dan special award of the Union of Innovators Croatia 2005.

List of International Awards

1. One of The World’s Most Influential Scientific Mind 2015 by Thomson Reuters for publishing the most number of highly cited papers during 11 year period 2003-2013.
3. Outstanding Contribution to the Drying Community Award 2009 at the 6th Asia-Pacific Drying Conference (ADC 2009), 19-21 October 2009, Bangkok, Thailand


23. Best Student Award dalam Leaving and Matriculation Examinations 1974, Leederville Technical College, Leederville, Western Australia.

b. National Awards

- Won the Merdeka Award 2016 for Oustanding Scholastic Achievement in Research and Development of Fuel Cells and Hydrogen Energy in Malaysia and the region.

- Elected Fellow of Academy of Science Malaysia 2012.
• Won 1 gold medal and Best of the Best Award at PENCIPTA 2013, 1 gold medal at ITEX 2010, 2 gold medals at ITEX 2009, 1 gold medal at MTE 2007, 1 gold medal at ITEX 2006, 1 gold medal at ITEX 2005, 2 gold medals at IPTA 2005 and 1 gold medal at ITEX 2000.

• Won 1 silver medal at MTE 2009, 1 silver medal at ITEX 2010, 5 silver medals at ITEX 2009, 2 silver medals at IPTA 2005 and 1 silver medal at EXPO S&T 2004.

• Won 2 bronze medals at MTE 2009, 3 bronze medals at ITEX 2009, 1 bronze medal at IPTA 2005, 7 bronze medals at EXPO S&T 2004 and 1 bronze medal at IPTA 2005.


**List of National Awards**

1. The Merdeka Award 2016 for Outstanding Scholastic Achievement in Research and Development of Fuel Cells and Hydrogen Energy in Malaysia and the region.

2. Gold Medal and the Best of the Best Award at the PENCIPTA 2013 exhibition for inventing the Fuel Cell Hydrogen Car on 7-9 November 2013.

3. Fellow of Academy of Science Malaysia on 27th April 2012.


7. Silver medal for inventing MEA Fabrication For Fuel Cell Using Casting Technique, 9th MTE 2010, 4-6 February 2010.


32. Bronze medals for inventing System Design For 5 Kw PEMFC System, the ITEX 2005.
38. Anugerah Saintis Cemerlang (Excellent Scientist Award) 2005 oleh Menteri Pengajian Tinggi.


47. Silver medal for inventing Solar Assisted Dehumidification System, ITEX 2003


49. Gold medal for inventing a Very Efficient Solar Dryer, ITEX 2000

50. The Henry Goh award for inventing A Very Efficient Solar Dryer, the ITEX 2000


c. UKM Awards


5. Gold medal for inventing Reaction Kinetics of Hydrogen Production from Autothermal Steam Reforming of Methanol Using Mo-Ni-Co Catalyst di Ekspo Penyelidikan dan Inovasi UKM 2005


7. Bronze medal for inventing Production of Membrane Electrode Assembly (MEA) for Proton Exchange Membrane Fuel Cell By Using Sol-Gel Casting di Ekspo Penyelidikan dan Inovasi UKM 2005

8. Bronze medal for inventing Electrically Conducting Composite Bipolar Plates di Ekspo Penyelidikan dan Inovasi UKM 2005


13. Gold medal for 1 kW polymer electrolyte membrane fuel cell prototype at the Ekspo Penyelidikan UKM 2004

14. Gold medal for compact pressure swing adsorption system for CO removal at the Ekspo Penyelidikan UKM 2004

15. Silver medal for solar hydrogen eco-house at the Ekspo Penyelidikan UKM 2004

16. Silver medal for Mangkin untuk penghasilan hidrogen daripada pembentukan semula metanol di the Ekspo Penyelidikan UKM 2004
17. Bronze medal for Sintesis dan pencirian fotomangkin tris- [1-(4- methoxyphenyl)-2-(4-carboxylphenyl)-1, 2-ethylenedithiolenic-s, s]\tungsten untuk penghasilan hidrogen daripada air-di the Ekspo Penyelidikan UKM 2004

18. Bronze medal for Reaktor membran seramik –ptfe untuk penghasilan hidrogen di the Ekspo Penyelidikan UKM 2004


20. Bronze medal for Prekursor fotomangkinheterogen untuk penghasilan hidrogen di the Ekspo Penyelidikan UKM 2004


2. RECOGNITION

2.1 Keynote and Invited Lectures

- Presented 23international keynote lectures in China, India, Indonesia, Iran, Malaysia, Philippines, Singapore and Thailand
- Presented 10international invited lectures Iceland, Indonesia, Japan, Malaysia, Netherlands, Philippines &Russia
- Presented 10national keynote lectures

a. International Keynote Lectures

Year2017:
1. Wan Ramli Wan Daud. Microbial electrolysis cells, novel hydrogen production technology: issues and challenges, the 13th International Conference on Global Sustainability and Chemical Engineering (ICGSCE), 15–16 February 2017, Putrajaya, Malaysia

Year 2015:

Year2014:
Palace Hotel & Suites, Kuching, Sarawak, Malaysia

**Year 2013:**

**Year 2012:**
8. Wan Ramli Wan Daud Bioenergy and Sustainability. The 2nd Malaysian International Conference on Trends in Biotechnology (MICTriBE 2012) 3 -4Julai 2012, Langkawi, Kedah, Malaysia

**Year 2011:**
9. Wan Ramli Wan Daud Drying of Foods. International Conference of Chemical Engineering and Industrial Biotechnology (ICCEIB 2011) In conjunction with The 25th Symposium of Malaysian Chemical Engineers(SOMCHE2011) 30 November 2011, Kuantan, Pahang, Malaysia

**Year 2010:**

**Year 2009:**

**Year 2007:**

**Year 2006:**
Year 2005:


Year 2003:

b. International Invited Lectures

Tahun 2011

Year 2010:

Year 2009:

Year 2008:


Year 2006:


Year 2005:
Netherlands, 7-9 November 2005

Year 2004:


c. National Keynote Lectures

Year 2016:


Year 2008:


Year 2007:


Year 2006:


Year 2004:


Year 2000:


2.2 Membership of International Committees

- Chairman, Institution of Chemical Engineers UK, Malaysia Board 2009.
• Committee Member (as Malaysian Board Chairman), International Council, Institution of Chemical Engineers UK 2009.
• Deputy Chairman, Institution of Chemical Engineers UK, Malaysia Board 2008.
• Chairman, International Advisory Committee, 15th Regional Symposium on Chemical Engineering and the 22nd Symposium of Malaysian Chemical Engineers RSCE-SOMCHE 2008, 2-3 December 2008, Kuala Lumpur, Malaysia.
• Committee Member, Institution of Chemical Engineers UK, Malaysia Board 2007.
• Member, the International Advisory Committee of the Regional Symposium on Membrane Science & Technology (2004-kini).
• Member, the International Advisory Committee of the International Workshop & Symposium on Industrial Drying (2004).
• Member, the International Organising Committee the Asian Particle Technology Symposium (2003-kini).
• Chairman, International Organising Committee, 2nd Asian Particle Technology Symposium (APT 2003) held on 17-19 December 2003, Penang, Malaysia.
• Member, the International Advisory Committee of the World Congress of Particle Technology (2002-2006).
• Member, the International Advisory Committee of the Regional Symposium of Chemical Engineering (2002-kini)
• Member, the International Advisory Committee the Asia-Pacific Drying Conference (2001-kini)
• Chairman, International Advisory Committee, 2nd Asia-Oceania Drying Conference (ADC’2001) 20 – 22 August 2001 in Penang, Malaysia

2.3 Member of Editorial Board/Referee/Reviewer of International Journals

• Guest Editor Special Issue of International Journal of Hydrogen Energy (SCOPUS/ISI) for the 3rd International Conference on Fuel Cell and Hydrogen Technology (ICFCHT2011), 22-24 November 2011, Malaysia
• Member of Editorial Board of Journal of Sustainable Energy and Environment published by the Joint Graduate School on Energy and Environment (JGSEE), King Mongkut's University of Technology Thonburi, Thailand
• Referee/Reviewer for the following journals:
  o Drying Technology (SCOPUS/ISI)
  o Solar Energy (SCOPUS/ISI)
  o International Journal of Hydrogen Energy (SCOPUS/ISI)
  o Chemical Engineering Science (SCOPUS/ISI)
  o International Journal of Food Engineering (SCOPUS/ISI)
  o Powder Technology (SCOPUS/ISI)
  o Chemical Engineering Research & Design (SCOPUS/ISI)
  o Separation Science & Technology (SCOPUS/ISI)
  o Sains Malaysia (SCOPUS/ISI)
  o World Applied Science Journal

2.4 External Examiner of Program/Department/Faculty, Assessor for accreditation Bodies & External Advisor of Phd & MSc Thesis

a. External Examiner of Academic Program

<table>
<thead>
<tr>
<th>University</th>
<th>Program</th>
<th>Year</th>
</tr>
</thead>
</table>

11
Universiti Sain Malaysia  BSc (Environmental Technology)  2011
Universiti Tun Hussein Onn Malaysia  BEng (Plant Engineering)  2010
Universiti Teknologi MARA  BEng (Chemical Engineering)  2005-2007
Universiti Teknologi Malaysia  BEng (Chemical Engineering)  2001
Universiti Teknologi MARA  BEng (Chemical Engineering)  1989-1991
Universiti Teknologi Malaysia  BEng (Chemical Engineering)  1988

b. Member of Evaluation Panel for Board of Engineers Malaysia

<table>
<thead>
<tr>
<th>University</th>
<th>Program</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universiti Teknologi Petronas  SMKej (Kejuruteraan Kimia)</td>
<td>1998</td>
<td></td>
</tr>
<tr>
<td>Universiti Malaya            SMKej (Kejuruteraan Kimia)</td>
<td>1995</td>
<td></td>
</tr>
</tbody>
</table>

c. Member of Evaluation Panel for National Accreditation Board

<table>
<thead>
<tr>
<th>University</th>
<th>Program</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taylor's College             MEng (Chemical Engineering)</td>
<td>2004</td>
<td></td>
</tr>
<tr>
<td>Prime College                Diploma (Chemical Engineering)</td>
<td>2003</td>
<td></td>
</tr>
</tbody>
</table>

d. Member of Evaluation Panel for Engineering Accreditation Council

<table>
<thead>
<tr>
<th>University</th>
<th>Program</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universiti Teknologi Malaysia  BEng (Gas Engineering)</td>
<td>2013</td>
<td></td>
</tr>
<tr>
<td>Taylor University Malaysia   BEng (Chemical Engineering)</td>
<td>2012</td>
<td></td>
</tr>
<tr>
<td>Universiti Teknologi Petronas  BEng (Chemical Engineering)</td>
<td>2011</td>
<td></td>
</tr>
<tr>
<td>Monash University Sunway Campus  BEng (Chemical Engineering)</td>
<td>2010</td>
<td></td>
</tr>
<tr>
<td>Universiti Malaysia Perlis    BEng (Bioprocess Engineering)</td>
<td>2010</td>
<td></td>
</tr>
<tr>
<td>Universiti Sains Malaysia     BEng (Chemical Engineering)</td>
<td>2010</td>
<td></td>
</tr>
</tbody>
</table>

e. External Examiner of Thesis

<table>
<thead>
<tr>
<th>University</th>
<th>Doctor of Philosophy</th>
<th>Master of Science</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universiti Malaya           0</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Universiti Sains Malaysia   1</td>
<td>6</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Universiti Teknologi Malaysia 3</td>
<td>3</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Universiti Putra Malaysia   0</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Universiti Teknologi Petronas 1</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>University of Nottingham in Malaysia 1</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>International Islamic University Malaysia 1</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Universiti Teknologi MARA   1</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Universiti Malaysia Kelantan 0</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Total                        8</td>
<td>16</td>
<td>24</td>
<td></td>
</tr>
</tbody>
</table>

i. List of PhD Thesis Examined as External Examiner

<table>
<thead>
<tr>
<th>No.</th>
<th>Year</th>
<th>University</th>
<th>Student</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2012</td>
<td>Universiti Teknologi MARA</td>
<td>Wan Ahmad Najmi  Wan Mohamed</td>
<td>Solid-state Thermal Analysis of Air-cooled PEMFC with Predictive</td>
</tr>
<tr>
<td>No.</td>
<td>Year</td>
<td>University</td>
<td>Student</td>
<td>Title</td>
</tr>
<tr>
<td>-----</td>
<td>------</td>
<td>---------------------------------</td>
<td>--------------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>1.</td>
<td>2012</td>
<td>Universiti Sains Malaysia</td>
<td>Anis Suriani Binti Ibrahim</td>
<td>Application of the Monin-Obukhov Similarity Theory on Diurnal Wind Turbulence Statistics in the Urban Roughness Sublayer Using Local Scales</td>
</tr>
<tr>
<td>2.</td>
<td>2012</td>
<td>Universiti Malaysia Kelantan</td>
<td>Rizki Wannahhari</td>
<td>The Recovery of Used Palm Cooking Oil Using Bagasse as Adsorbent</td>
</tr>
<tr>
<td>4.</td>
<td>2009</td>
<td>Universiti Putra Malaysia</td>
<td>Keshani, S.</td>
<td>Mathematical Models For Prediction Of Rheological Parameters Of Pomelo Juice</td>
</tr>
<tr>
<td>6.</td>
<td>2007</td>
<td>Universiti Putra Malaysia</td>
<td>Rozaihan binti Razali</td>
<td>A study of the effect of fermentation, drying technique and added carotene oil on nutritional value of cassava</td>
</tr>
<tr>
<td>7.</td>
<td>2005</td>
<td>Universiti Putra Malaysia</td>
<td>Soo Ching Yee</td>
<td>Dynamics and Convergence Aceleration of Rapid Pressure Swing Adsorption (RPSA)</td>
</tr>
<tr>
<td>8.</td>
<td>2005</td>
<td>Universiti Sains Malaysia</td>
<td>Chieng Hui Yap</td>
<td>Penggunaan Sel Galvanik Yang Mempunyai Berbagai Konfigurasi Untuk Menurunkan Kromium Heksavalen Dalam Air Buangan Elektrosaduran</td>
</tr>
<tr>
<td>9.</td>
<td>2005</td>
<td>Universiti Teknologi Malaysia</td>
<td>Mak Weng Yee</td>
<td>Fault Detection and Diagnosis (FDD) Using Multivariate Statistical Process Control via Correlation Coefficients</td>
</tr>
<tr>
<td>10.</td>
<td>2005</td>
<td>Universiti Sains Malaysia</td>
<td>Chua Joo Han</td>
<td>Adsorption of Fatty Acids using Metal Silica Complexes from Rice Husks</td>
</tr>
<tr>
<td>11.</td>
<td>2005</td>
<td>Universiti Teknologi Malaysia</td>
<td>Rosiah Rohani</td>
<td>Preparation of proton exchange membrane by radiation-induced grafting method: Grafting of styrene onto poly(ethylene tetrafluoroethylene) copolymer films</td>
</tr>
<tr>
<td>12.</td>
<td>2000</td>
<td>Universiti Sains Malaysia</td>
<td>Yiu Pang Hung</td>
<td>Studies using the galvanic reduction process for hexavalent chromium in wastewater</td>
</tr>
<tr>
<td>13.</td>
<td>1999</td>
<td>Universiti Teknologi Malaysia</td>
<td>Lee Ting Hui</td>
<td>Hasil buangan nenas sebagai sumber karbon untuk penghasilan asid sitrik oleh Aspergillus sp</td>
</tr>
<tr>
<td>14.</td>
<td>1999</td>
<td>Universiti Malaya</td>
<td>Abdul Basir Aziz Khan</td>
<td>An Epistemological Study of Malaysia’s Science and Technology Policy</td>
</tr>
<tr>
<td>15.</td>
<td>1995</td>
<td>Universiti Sains Malaysia</td>
<td>Gurdeep Kaur a/p Bakjsis Singh</td>
<td>Pengembalian Hidrometalurgi Niobium dari sati Larutan Pemelarutresapan HF:HCl Kolumbit</td>
</tr>
<tr>
<td>16.</td>
<td>1999</td>
<td>Universiti Malaya</td>
<td>Abdul Basir Aziz Khan</td>
<td>National Science Policy</td>
</tr>
</tbody>
</table>

2.5 Appointment of Adjunct/Visiting Professor and Academic Assessor/Advisor

**Appointment of Adjunct Professor**

<table>
<thead>
<tr>
<th>Period</th>
<th>Faculty/Department</th>
<th>University</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011-2012</td>
<td>Faculty of Mechanical Engineering</td>
<td>Universiti Tun Hussein Malaysia</td>
</tr>
</tbody>
</table>

**Appointment of Visiting Professor**

<table>
<thead>
<tr>
<th>Period</th>
<th>Faculty/Department</th>
<th>University</th>
</tr>
</thead>
<tbody>
<tr>
<td>27/07/ 2011</td>
<td>Faculty of Mechanical Engineering</td>
<td>Universiti Tun Hussein Malaysia</td>
</tr>
</tbody>
</table>

**Appointment of Academic Assessor/Advisor**

<table>
<thead>
<tr>
<th>Period</th>
<th>Department</th>
<th>University</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010-2012</td>
<td>Centre for Graduate Studies</td>
<td>Universiti Industri Selangor</td>
</tr>
</tbody>
</table>

**Appointment of Company Associate**

<table>
<thead>
<tr>
<th>Date</th>
<th>Associate/Advisor</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>09/2011</td>
<td>Senior Associate</td>
<td>Malaysia Industry Group For Hight Technology (MIGHT)</td>
</tr>
</tbody>
</table>

3.  **RESEARCH**
3.1 Fields of Research:

- Fuel cell technology: composite and inorganic electrolyte membranes, nanocatalyst electrodes, membrane electrode assemblies, stack and cell design and prototyping, fuel cell system design, solid oxide fuel cell, direct methanol fuel cell, microbial fuel cell

- Hydrogen energy: Nano-catalyst for autothermal steam reforming of alcohols, biohydrogen, solar hydrogen, photoelectrochemical cell

- Drying engineering: drum drying of starch slurries, fluidised bed and spouted bed drying of particulate materials, superheated steam drying of fibres, selective drying of multi-component solvents, drying kinetics and solar drying of agricultural crops and medicinal herbs

- Extraction: solvent extraction of antioxidants from spices and herbs, supercritical fluid extraction: thermodynamics and mass transfer of supercritical fluids and supercritical fluid extractions of anti-oxidants and essential oils from herbs

- Food properties: rheology of food material

- Design of membrane separation modules and adsorbers

- Process system engineering: process synthesis and optimization of chemical and biochemical processes including proton exchange membrane fuel cell systems

- Particle technology: flow properties of powders and fluidisation;

- History and philosophy of science and technology: Malay technology

3.2 List of Research Projects:

<table>
<thead>
<tr>
<th>No.</th>
<th>Project Code</th>
<th>Project Title</th>
<th>Role</th>
<th>Total grant (MYR)</th>
<th>Project period</th>
<th>Source of fund</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>LRGS/2013/UKM/TK</td>
<td>Zero Emission Fuel Cell Vehicle Powered by Hydrogen</td>
<td>Program Leader &amp; Project Leader</td>
<td>7,000,000</td>
<td>1/7/2013-30/6/2016</td>
<td>LRGS, MOE</td>
</tr>
<tr>
<td>3.</td>
<td>FRGS/1/2013/TK05/UKM/01/1</td>
<td>Functional Spray Dried Amino Acid Powders With Controlled Polymorphs And Crystallinity</td>
<td>Project Leader</td>
<td>106,000</td>
<td>01/4/2013-31/3/2016</td>
<td>FRGS, KPT</td>
</tr>
<tr>
<td>5.</td>
<td>ERGS/1/2012/TK05/UKM/01/2</td>
<td></td>
<td>Project Leader</td>
<td>64,000</td>
<td>1/6/2012-1/6/2015</td>
<td>FRGS, KPT</td>
</tr>
<tr>
<td>No.</td>
<td>Code</td>
<td>Title</td>
<td>Leader</td>
<td>Budget</td>
<td>Start Date</td>
<td>End Date</td>
</tr>
<tr>
<td>-----</td>
<td>------</td>
<td>----------------------------------------------------------------------</td>
<td>--------</td>
<td>---------</td>
<td>------------</td>
<td>----------</td>
</tr>
<tr>
<td>7</td>
<td>UKM-AP-2011-02</td>
<td>Clean Energy for Tomorrow: Towards Zero Emission and Carbon Free Future</td>
<td>100,000</td>
<td>01/08/2011</td>
<td>31/07/2013</td>
<td>Projek Arus Perdana, UKM</td>
</tr>
<tr>
<td>9</td>
<td>UKM-GUP-TK-08-17-323</td>
<td>PEM Fuel Cell Stack with Sided Fuel Inlet and Integrated Stacking Device</td>
<td>300,000</td>
<td>01/05/2008</td>
<td>31/10/2010</td>
<td>Geran Univeriti Penyelidikan</td>
</tr>
<tr>
<td>10</td>
<td>03-01-02-SF0046</td>
<td>Computational fluid dynamics modelling of spray dryer with wall deposition</td>
<td>295,000</td>
<td>01/07/2007</td>
<td>-</td>
<td>ScienceFund</td>
</tr>
<tr>
<td>11</td>
<td>03-01-02-SF0396</td>
<td>Development of novel depositless spray dryer</td>
<td>211,000</td>
<td>01/08/2007</td>
<td>-</td>
<td>ScienceFund</td>
</tr>
<tr>
<td>12</td>
<td>03-01-02-SF0405</td>
<td>Development of low temperature solid oxide fuel cell electrolytes and electrodes</td>
<td>308,720</td>
<td>01/08/2007</td>
<td>-</td>
<td>ScienceFund</td>
</tr>
<tr>
<td>13</td>
<td>UKM-KK-02-FRGS0007-2006</td>
<td>Crystallization process of pharmaceuticals and macromolecules (proteins): Understanding polymorphism and chiral separation via molecular recognition and self assembly</td>
<td>90,000</td>
<td>01/11/2006</td>
<td>31/10/2009</td>
<td>Fundamental Research Grant Scheme (FRGS)</td>
</tr>
<tr>
<td>14</td>
<td>UKM-MTSF-SELFUEL-2009</td>
<td>Optimization of Electricity Generation Using Microbial Fuel Cells for Wastewater Treatment</td>
<td>20,000</td>
<td>12/10/2009</td>
<td>-</td>
<td>Malaysian Toray Science Foundation (MTSF)</td>
</tr>
<tr>
<td>16</td>
<td>0202020001 PR0023/11-06</td>
<td>Design, simulation, fabrication and long term performance testing of a compact 5 kW proton exchange membrane fuel cell system</td>
<td>6,455,992</td>
<td>2002-2007</td>
<td>-</td>
<td>IRPA</td>
</tr>
<tr>
<td>17</td>
<td>0202020006 PR0023/11-11</td>
<td>Development of a dye-sensitised photoelectrochemical cell for the production of hydrogen by unassisted photolysis of water</td>
<td>2,038,332</td>
<td>2002-2007</td>
<td>-</td>
<td>IRPA</td>
</tr>
<tr>
<td>18</td>
<td>0802020020</td>
<td>Volatile organic compounds removal technology based on</td>
<td>1,600,000</td>
<td>1997-2000</td>
<td>-</td>
<td>IRPA</td>
</tr>
<tr>
<td>Project Code</td>
<td>Project Title</td>
<td>Project Leader</td>
<td>Budget</td>
<td>Duration</td>
<td>Funding Agency</td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>---------------</td>
<td>----------------</td>
<td>--------</td>
<td>----------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td>0202020011</td>
<td>Development of photoelectrochemical cells for hydrogen production for fuel cell use</td>
<td>Project Leader</td>
<td>214,000</td>
<td>1999 – 2001</td>
<td>IRPA</td>
<td></td>
</tr>
<tr>
<td>0302020028</td>
<td>Novel drying technologies</td>
<td>Project Leader</td>
<td>880,000</td>
<td>1998 – 2002</td>
<td>IRPA</td>
<td></td>
</tr>
<tr>
<td>010703014</td>
<td>Drying of agricultural products</td>
<td>Project Leader</td>
<td>600,000</td>
<td>1988 – 1995</td>
<td>IRPA</td>
<td></td>
</tr>
<tr>
<td>03-01-02-SF0253</td>
<td>Superheated Steam Drying of Oil Palm Frond Chips in a Vibrating Fluidized Bed Dryer</td>
<td>Co-Researcher</td>
<td>283,000</td>
<td>2007-2009</td>
<td>ScienceFund</td>
<td></td>
</tr>
<tr>
<td>0902020127</td>
<td>Fluidized bed for dedusting and drying of padi</td>
<td>Co-Researcher</td>
<td>901,000</td>
<td>1997 – 2000</td>
<td>IRPA</td>
<td></td>
</tr>
<tr>
<td>02-02-02-0001-PR-23/11-09</td>
<td>Development of an Onboard Low Temperature Autothermal Fuel Processor from Liquid Fuel</td>
<td>Co-Researcher</td>
<td>1,606,928</td>
<td>2000 – 2007</td>
<td>IRPA</td>
<td></td>
</tr>
<tr>
<td>0202020002</td>
<td>Development and long term performance testing of bipolar plates</td>
<td>Co-Researcher</td>
<td>2000 – 2007</td>
<td>IRPA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>09020200091</td>
<td>Enhancing product purity and yield in the extraction of herbal oils using supercritical carbon dioxide</td>
<td>Co-Researcher</td>
<td>-</td>
<td>2003 – 2006</td>
<td>IRPA</td>
<td></td>
</tr>
<tr>
<td>02-02-02-0003-PR0023/11-08</td>
<td>Development And Long Term Performance Testing Of Membrane Electrode Assemblies (MEA) For Proton Exchange Membrane Fuel Cell</td>
<td>Co-Researcher</td>
<td>1,600,200</td>
<td>2000 – 2007</td>
<td>IRPA</td>
<td></td>
</tr>
<tr>
<td>0902020011</td>
<td>Novel extraction of aqueous two-phase systems for recovery of bioproducts from fermentation broth</td>
<td>Co-Researcher</td>
<td>-</td>
<td>2001 – 2005</td>
<td>IRPA</td>
<td></td>
</tr>
<tr>
<td>0202020002</td>
<td>Development of a commercially competitive proton exchange membrane fuel cell</td>
<td>Co-Researcher</td>
<td>-</td>
<td>1996 - 1999</td>
<td>IRPA</td>
<td></td>
</tr>
<tr>
<td>0402020039</td>
<td>Development of computational fluid dynamics (CFD) analysis for flow in stirred tank reactor</td>
<td>Co-Researcher</td>
<td>-</td>
<td>2000 – 2002</td>
<td>IRPA</td>
<td></td>
</tr>
</tbody>
</table>

3.3 Research Collaboration
### a. International Research Collaboration

<table>
<thead>
<tr>
<th>No.</th>
<th>Researcher</th>
<th>Institution</th>
<th>Field of Research</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Prof. Vijay Raghavan</td>
<td>Department of Bioresource Engineering, Faculty of Agricultural and Environmental Sciences, McGill University, Canada</td>
<td>Microwave-vacuum drying</td>
<td>2008-</td>
</tr>
<tr>
<td>2.</td>
<td>Prof. Nigel Brandon</td>
<td>Department of Earth Science &amp; Engineering, Imperial College London, United Kingdom</td>
<td>Intermediate and low temperature anode, electrolyte and cathode for solid oxide fuel cells</td>
<td>2007-</td>
</tr>
<tr>
<td>3.</td>
<td>Prof. Nobuyoshi Nakagawa</td>
<td>Graduate Department of Chemical Engineering, Gunma University, Kiryu, Japan</td>
<td>Direct alcohol fuel cells</td>
<td>2007-</td>
</tr>
<tr>
<td>4.</td>
<td>Prof. Roberts, K.J.</td>
<td>Institute of Particle Science and Engineering, Leeds University, United Kingdom</td>
<td>Control of batch crystallisation of L-Isoleucine through on-line monitoring system</td>
<td>2005 – 2010</td>
</tr>
<tr>
<td>5.</td>
<td>Dr. Robert Driscoll</td>
<td>School of Chemical Engineering and Industrial Chemistry, University of New South Wales, Sydney, Australia</td>
<td>Fluidized bed drying of paddy</td>
<td>2005</td>
</tr>
<tr>
<td>6.</td>
<td>Prof. Dr. Ir. Tun Teja Irawadi, Dr. Ir. Irawadi Jamaran dan Prof. Ir. Maarimi</td>
<td>Bogor Agricultural University, Bogor, Indonesia</td>
<td>Supercritical Fluid Extraction (SFE) of Sea Cucumber</td>
<td>2006 - 2009</td>
</tr>
<tr>
<td>7.</td>
<td>Prof. Arun S. Mujumdar</td>
<td>Department of Mechanical and Production Engineering, National University of Singapore</td>
<td>Industrial Drying Technology and Computational Fluid Dynamic in Dryers and in Fuel Cells</td>
<td>2004 -</td>
</tr>
<tr>
<td>8.</td>
<td>Assoc. Prof. Dr. Eric Bigerson</td>
<td>Department of Chemical and Biomolecular Engineering, National University of Singapore</td>
<td>Computational Fluid Dynamic in Fuel Cell</td>
<td>2004 -</td>
</tr>
</tbody>
</table>

### b. National Research Collaboration

<table>
<thead>
<tr>
<th>No.</th>
<th>Researcher</th>
<th>Institution</th>
<th>Field of Research</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Pn. Nurul Fitriah Nasir</td>
<td>Faculty of Mechanical Engineering, Universiti Tun Husseion Onn Malaysia</td>
<td>Modeling and optimization of continuous and batch biodisel processes using homogenouns and heterogeneous catalysts</td>
<td>2010-</td>
</tr>
</tbody>
</table>
2. Assoc. Prof. Dr. Dominic Foo  
Department of Chemical Engineering, Faculty of Engineering, University of Nottingham Malaysia Campus  
Process system engineering of fuel cells  
2009

3. Assoc. Prof. Dr. Law Chung Lim,  
Department of Chemical Engineering, Faculty of Engineering, University of Nottingham Malaysia Campus  
Fluidized bed drying of padi, spray drying and two stage heat pump drying of fruits  
2006 –

4. Noornizar Anuar  
Faculty of Chemical Engineering Universiti Teknologi MARA  
Control of batch crystallisation of L-Isoleucine through on-line monitoring system  
2005 –

5. Dr. Ibnu Hajar Rukunudin, Ooi Ho Seng and Ten Seng Teik,  
Malaysian Agricultural Research & Development Institute  
Drying of kenaf fibers  
2002 - 2004

6. Dr. Mohd Zamri Ibrahim  
Fakulti Sains, Universiti Malaysia Terengganu  
Hybrid wind-PV solar hydrogen system  
2003 – 2005

7. Prof. Dr. Farid Ani Nasir  
Faculty of Mechanical Engineering, Universiti Teknologi Malaysia  
Preparation and characterization of carbon molecular sieve produced from oil palm  
2004 – 2006

8. Prof.f Dr. Hamdani Saidi, Prof. Dr. Ahmad Fauzi Isnmail, Prof. Dr. Nor Aishah Saidina Amin dan Assoc. Prof. Dr. Ahmad Rahman Songip  
Faculty of Chemical & Natural Resources Engineering, Prof. Md. Nor Musa, Faculty of Mechanical Engineering, Universiti Teknologi Malaysia  
Development of polymer electrolyte membrane fuel cell for mobile and portable application  
1996 -

4 Intellectual Property

- Granted 8 patents by MyPO
- Granted 5 World patents
- Filed 28 patents at MyIPO
- Filed 1 trade mark at MyIPO

a. List of Patents Granted

<table>
<thead>
<tr>
<th>No.</th>
<th>Inventors</th>
<th>Invention</th>
<th>Date Granted</th>
<th>Certificate No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Wan Ramli Wan Daud, Kamaruzzaman Sopian, Ja’afar Sahari, Che Hassan Che Haron, Abu Bakar Mohamad, Abd. Amir Hassan Kadhum, Mohd. Shahbudin Mastar @ Masdar, Masli</td>
<td>Water-Cooled polymer Electrolyte Membrane Fuel Cell Stack</td>
<td>21/12/2011</td>
<td>MY-145097-A</td>
</tr>
</tbody>
</table>
   Cu-Zn-Al Catalyst Supported on Zeolite for hydrogen production from methanol
   15/3/2011 MY-142900-A

4. Ja’afar Bin Shaari @ Shaari, Wan Ramli Wan Daud
   A Method of Producing Bipolar Plate
   15/12/2011 MY-144996-A

5. Abu Bakar Mohamad, Wan Ramli Wan Daud, Abdul Amir Hassan Kadhum, Ramli Sitanggang, Mohd Shahbudin Masdar
   Innovative Membrane Electrode Assembly (MEA) Design for Proton Exchange Membrane Fuel Cell (PEMFC)
   15/8/2011 MY-144183-A

6. Wan Ramli Wan Daud, Lorna Jefferey Minggu, Mohammad Kassim, Fadhli Hadanah
   A Photocatalyst for Hydrogen Production
   29/7/2011 MY-143950-A

   An Electrochemical Power Generator
   29/8/2011 MY-144241-A

8. Mohammad bin Kassim, Wan Ramli Wan Daud, Lorna Jeffrey Minggu, Khuzaimeh Ariffin, Fadhli Hadanah
   Novel Photocatalysts & Preparation Method Thereof
   13/1/2012 MY-145222-A

b. List of Filed World patents

<table>
<thead>
<tr>
<th>No.</th>
<th>Inventors</th>
<th>Invention</th>
<th>Filing date</th>
<th>Published date</th>
<th>Reference No.</th>
</tr>
</thead>
</table>
### c. List of Filed Patents at MyIPO

<table>
<thead>
<tr>
<th>No.</th>
<th>Inventors</th>
<th>Invention</th>
<th>Filing date</th>
<th>Reference No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.</td>
<td>Wan Ramli Wan Daud, Kamaruzzaman Sopian, Ja’afar Sahari, Che Hassan Che Haron, Abu</td>
<td>Polymer Electrolyte Membrane Fuel Cell</td>
<td>03/11/2008</td>
<td>PI20084371</td>
</tr>
</tbody>
</table>
13. Ja'afar Sahari, Wan Ramli Wan Daud, Norhamidi Muhamad & Dedikarni Panuh
   Stack with Open Cathode
   PI20083067

14. Ja'afar Sahari, Wan Ramli Wan Daud, Norhamidi Muhamad & Dedikarni Panuh
   A Method of Producing Bipolar Plate
   Polymer Composite Bipolar Plate
   PI20085127

15. Yaakob, Z., Wan Ramli Wan Daud M. Rosli Yosfiah & Jamalaiah Jahim
   Mo-Ni-Cu Catalyst on gamma Al2O3 Support for hydrogen production from methanol
   PI20080488

   Cu-Zn-Al Catalyst Supported on Zeolite for hydrogen production from methanol
   PI20080487

17. Mohammad Kassim, Wan Ramli Wan Daud, Daik, R.&Rahman, F.H.
   A Method of Synthesizing a Photocatalyst for Hydrogen Production
   PI20084656

18. Wan Ramli Wan Daud, Abu Bakar Muhammad, Abdul Amir Hassan Kadhum, Jaafer Sahari, Kamaruzzaman Sopian, Masli Irwan Rosli & Shahbudin Mastar
   Compact pressure swing adsorber for hydrogen purification (CPSA)
   PI20072055

   An Electrochemical Power Generator (LESTARI)
   PI20072029

   A photocatalyst for solar hydrogen production
   PI20072119.

21. Yaakob, Z., Wan Ramli Wan Daud & Lorna Minggu
   Cu-Zn-Al Catalysts Promoted With Palladium For Hydrogen Production From Methanol
   PI20072030.

22. Abu Bakar Mohamad, Abdul Amir Hasan Kadhum, Wan Ramli Wan Daud, Mimi Abu Bakar &Sitanggang, R.
   Process for Making Catalyst by Impregnation of Platinum of Activated Carbon
   PI20071902.

23. Abu Bakar Mohamad, Abdul Amir Hasan Kadhum, Wan Ramli Wan Daud &Sitanggang, R.
   Innovative Membrane Electrode Assembly (MEA) Design for Proton Exchange Membrane Fuel Cell (PEMFC)
   PI20072279.

24. Yaakob, Z., Wan Ramli Wan Daud & Mohd Sabri Mahmud
   Cu-Zn-Al Catalyst Promoted with Vanadium for hydrogen production from methanol
   PI20072270

   Hydrogen Production Method (PV wind hydrogen production
   PI20071969
26. Kamaruzzaman Sopian & Wan Ramli Wan Daud

A method for producing hydrogen and a system for supplying same to a building and/or the like (Solar hydrogen eco-house)

13/11/2007 PI20071970

27. Kamaruzzaman Sopian, Wan Ramli Wan Daud & Mohd. Zamri Ibrahim

Polymer Electrolyte Membrane (PEM) electrolyzer for the production of hydrogen from solar energy

13/11/2007 PI20071971

28. Abu Bakar Mohammed (Project Leader), Wan Ramli bin Wan Daud, Abd. Amir Hassan Kadhum, Mahreni Akhmad

Self Humidified Nanocomposite Membrane Of Nafion-Sio2-Pwa

9 August 2010. PI 201003752

d. Trade Mark
1. SERINDIT (07019005)

5 Publication:

ISI WOS Researcher ID: B-3635-2013

- Number of Indexed Articles WOS: 257

SCOPUS Author ID: 35547717400

- Number of Indexed Articles SCOPUS: 305

GOOGLE SCHOLAR

- Number of Indexed Articles GOOGLE: 485
- Total citations GOOGLE SCHOLAR (1995-2016) on 24May 2017: 7151

Publication Summary:

Published 934 articles:

- Published 342 articles in international journals,
- Published 367 articles in international conference proceedings
- Published 225 articles in national conference proceedings
- Published 2 international research books
- Published 5 chapters in international research books
• Edited 6 international conference proceedings
• Edited 8 journal issues as Chief Editor of Jurnal Kejuruteraan and Jurnal Kejuruteraan Kimia.
• Guest edited Special Issue of International Journal of Hydrogen Energy
• Published 2 national books
• Published 5 chapters in national research books
• Translated 2 books

a. Articles in International Journals:

Year 2017:


Year 2016:


Year 2015:


Year 2014:


**Year 2013:**


**Year 2012:**


Year 2011:


150. Shahgaldi, S., Yaakob, Z., Khadem, D.J., Ahmadrezaei, M., Daud, W.R.W. 2011. Synthesis and characterization of cobalt-free Ba0.5Sr0.5Fe0.8Cu0.2O3-δ perovskite oxide cathode nanofibers. Journal of Alloys and Compounds 509 (37): 9005-9009.


Year 2010:


Year 2009:


Year 2008:


Year 2007:


Year 2006:


Year 2005:


Year 2004:


Year2003:


Year2002:


Year2001:


Year2000:


Year 1999:


Year 1997:


Year 1996:


Year 1995:


Year 1993:

Year 1992:

Year 1991:

Year 1990:

Year 1989:

Year 1988:

Year 1986:

b. Articles in Proceedings of International Conferences

Tahun 2015:


**Tahun 2014:**


Year 2013:


Year 2012:


Tahun 2011:


77. Mojgan Ahmadrezaei, Muchtar, A., Daud, W.R.W., Muhamad, N. & Tan E.Y.. 2011. Characteristic and electrochemical performance of Ba0.2Sr0.8Co0.8Fe0.2O3- Cathode materials for intermediate temperature solid oxide fuel cells. Proceeding of The 3rd International Conference on Fuel Cell & Hydrogen Technology (ICFCHT 2011), 22 - 23 November 2011, InterContinental Hotel, Kuala Lumpur, Malaysia.


Year 2010:


Year 2009:


126. Muchtar, A., Hamid, N.A., Muhamad, N.&Daud, W.R.W. 2009. Development La1-xSrxCo0.8Fe0.8O3 (LSCF) cathodes for intermediate temperature solid oxide fuel cells (IT-SOFCs). International


Year 2008:


Year 2007:


Year 2006:


Year 2005:


Year 2004:


Year 2003:


Year 2002:


Year 2001:


Year 2000:


Year 1999:


Year 1998:


Year 1997:


Year 1996:


Year 1995:


352. Daud, W.R.W., Abdullah, I., & Bakar, B.. 1995. Rheological Characterisation of Natural Rubber/Liquid Natural Rubber/Polypropylene/Low Low Density Polyethylene Blend Melt at 200C, First International Conference on Strategic Technologies, ICAST '95, Universiti Kebangsaan Malaysia, 12th to 17th June 1995

353. Daud, W.R.W., Abdullah, I., & Bakar, B.. 1995. Rheological Characterisation of Natural Rubber/Liquid Natural Rubber/Polypropylene Blend Melt at 200C, First International Conference on Strategic Technologies, ICAST '95, Universiti Kebangsaan Malaysia, 12th to 17th June 1995


Year 1994:


Year 1990:


Tahun 1989:


Year 1988:


Year 1987:


c. Articles in Proceedings of National Conferences

Year 2010:


Year 2009:


Year 2008:


Year 2007:


Year 2006:


Year 2005:


Year 2004:


Year 2003:


Year 2002:


Year 2001:


Year 2000:


Year1999:


Year 1998:


Year 1996:


Fuel Cell (PEMFCs), Proceedings of the 12th Symposium of Malaysian Chemical Engineers (SOMCE’96), 367 - 372.


Year 1995:


Year 1994:


Year 1993:


Year 1992:


Year 1991:


Year 1990:


Year 1989:


Year 1988:


Year 1987:


Year 1986:


d. General Articles

Year 1993:


2. Daud, W.R.W. 1993. Pemikiran sains al-Biruni (al-Biruni’s Scientific Thought), ASASAINS, 1/93, ms. 3 - 19


Year 1992:


Year 1990:


Year 1989:


Book Publications

a. International Books

i. International Research Books


ii. Chapters in International Research Books


iii. Editing of International Conference Proceedings


b. National Books

ii. National Research Books


ii. Chapters in National Research Books


iii. National Text Book


iv. Translated Books

v. Editing of Journals


vi. Editing of National Conference Proceedings


3. EXCELLENCE IN ACADEMIC LEADERSHIP AND MANAGEMENT

4.1 Administrative Appointment in UKM:

- Director, Fuel Cell Institute, Universiti Kebangsaan Malaysia (2010-2011)
- Founding Director, Fuel Cell Institute, Universiti Kebangsaan Malaysia (2007-2009)
- Chief Editor, Jurnal Kejuruteraan, jurnal of the Faculty of Engineering & Built Environment, UKM (1999–2004).
- Coordinator, Master of Engineering program by coursework (Chemical Engineering) (2000-2006).
- Member of Senate, Universiti Kebangsaan Malaysia (1998–2004).
• Head, Department of Chemical & Process Engineering, Faculty of Engineering, Universiti Kebangsaan Malaysia (1984–1988)

4.2 Leadership in International Academic and Professional Societies

• Ex-Officio Immediate Past Chairman, Institution of Chemical Engineers, Malaysia Board 2010.
• Chairman, Institution of Chemical Engineers, Malaysia Board 2009.
• Deputy Chairman, Institution of Chemical Engineers, Malaysia Board 2008.
• Chairman, International Advisory Committee, 15th Regional Symposium on Chemical Engineering and the 22nd Symposium of Malaysian Chemical Engineers RSCE-SOMCHE 2008, 2-3 December 2008, Kuala Lumpur, Malaysia.
• Chairman, International Organising Committee, 2nd Asian Particle Technology Symposium (APT 2003) held on 17-19 December 2003, Penang, Malaysia.
• Chairman, International Advisory Committee, 2nd Asia-Oceania Drying Conference (ADC’2001) 20 – 22 August 2001 in Penang, Malaysia.

4. Public Service

5.1 Membership of International Academic and Professional Societies

• Member, American Chemical Society, Membership no. 30086954 (2009-)
• Fellow, Institution of Chemical Engineers, United Kingdom, Membership no. 249300 (2007-).
• Chartered Chemical Engineer at the Institution of Chemical Engineers, United Kingdom and The Engineering Council UK (Registration No: 564829) (2007-)
• Associate Member, Institution of Chemical Engineers, Membership no. 249300 (1999-2006)
• Fellow Islamic Academy, United Kingdom (1984-)

5.2 Membership in National Academic and Professional Societies

• Fellow of the Academy of Science Malaysia
• Professional Engineer registered with the Board of Engineers Malaysia, Registration No. : 8561 (Chemical Engineering) (1996 -)
• Corporate Member, Institution of Engineers Malaysia, Member No. 07766 (1996-)
• Founding Corporate Member, Institusi Jurutera Kimia Malaysia (1985-2006) (Noe the Malaysia Branch of the Institution of Chemical Engineers)
• Life Member, Akademi Sains Islam Malaysia (1986-).

5.3 Leadership in National Academic and Professional Societies

• President, Akademi Sains Islam Malaysia (2004-2010).
Chief Editor, Jurnal Juruter Kimia Malaysia, journal the Institution of Chemical Engineers Malaysia (2000–2006).
General Secretary, Akademi Sains Islam Malaysia (1997–2004)
Committee Member, Akademi Sains Islam Malaysia (1995–1996)
Member of Council, Institusi Juruter Kimia Malaysia (1993-2004)
General Secretary, Akademi Sains Islam Malaysia (1991–1995)

5.4 Leadership in National Committees

- Member, Examination & Qualification Committee, Board of Engineers Malaysia (2010-2012).
- Member, Examination & Qualification Committee, Board of Engineers Malaysia (2009-2010).
- Member of Evaluation Panel for the Engineering Accreditation Council, Board of Engineers Malaysia (2009–)
- Assessor for Chemical Engineering Programs at Board of Engineers Malaysia (2000-2007)
- Member of Panel of Judges for the Intel’s Science and Engineering Fair Malaysia Section 2000.
- Chairman of Technical Committee evaluating a project proposal on fuel cells under the Industrial Grant Scheme, Ministry of Science, technology and Environment (now Ministry of Science, Technology and Innovations) (1998)
- Member Technical committee evaluating research and development project proposals on energy at the Ministry of Science, technology and Environment (now Ministry of Science, Technology and Innovations) (1996-2000)

5.5 Chemical Engineering Consulting Work

- Completed 54 chemical engineering consulting work on Quantitative Risk Assessment of on-shore and off-shore oil and gas production installations, gas processing plants, gas pipelines, petrochemical plants, power stations and rail transport.
- Completed 6 environmental impact assessment of manufacturing plants, power stations and petrochemical plants.
- Completed 1 chemical engineering design project for extraction of waste heat from transformer coolers.

a. Quantitative Risk Assessment


25. Fisal, Z., Daud, W.R.W., Takriff, M.S., and Tasirin, S.M., 1997 Quantitative Risk and Hazard Analysis of the Proposed PGU Loop 2, dan Petronas Gas Malaysia Berhad


b. Environmental Impact Assessment


a. Chemical Engineering Design


6. TEACHING AND SUPERVISION

6.1 Teaching

a. Post-Graduate Teaching

Courses Taught
- Computer Aided Chemical Process Design (2002-)
- Energy and the Environment (2000-)
- Air Pollutant Chemistry and Dispersion (1999-)
- Air Pollution Control (1999-)

b. Under-Graduate Teaching

Courses Taught:
- Separation Processes (2006-2007)
- Food Engineering (1999-)
- Chemical Process Principles (1999-)
- Technology and Civilization (1990-2006)

6.2 Supervision of Doctor of Philosophy & Master of Science Students

<table>
<thead>
<tr>
<th>Degree</th>
<th>Supervisor</th>
<th>Graduated</th>
<th>Ongoing</th>
<th>Withdrawn</th>
<th>Total</th>
<th>Overall Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Period</td>
<td>Student</td>
<td>Title of Thesis</td>
<td>Supervisory role</td>
<td>Status of student</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>--------</td>
<td>---------</td>
<td>-----------------</td>
<td>------------------</td>
<td>------------------</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2016-</td>
<td>Ros Emilia Binti Rosli</td>
<td>Reka Bentuk dan Pengembangan Sistem Sel Fuel PEM Bersuatu Tinggi</td>
<td>Ahli J/K Penyeliaan</td>
<td>Sedang maju</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2016</td>
<td>Siti Najibah Abd Rahman</td>
<td>Reka Bentuk dan Pembangunan Penjana Kuasa Mudah Alih Sel Bahan Api</td>
<td>Ahli J/K Penyeliaan</td>
<td>Sedang maju</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2016-</td>
<td>Raba’atun Adawiyah Shamsuddin</td>
<td>Corrosion of Heat Treated Stainless Steel For Use As Base of Biocathode in Microbial Electrolysis Cell</td>
<td>Pengerusi J/K Penyeliaan</td>
<td>Sedang maju</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2015-</td>
<td>Ibdal Satar</td>
<td>Sel mikrobial elektrolisis</td>
<td>Main Supervisor</td>
<td>Ongoing</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>2014-</td>
<td>Siti Mariam Bt. Daud</td>
<td>Earthen Ware And Ceramic Membrane As A Separator In Microbial Fuel Cell</td>
<td>Chairman of Graduate Committee</td>
<td>Ongoing</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>2014-</td>
<td>Nur Fawwaz Binti Asri</td>
<td>Kajian Keberaliran Elektrik Plat Dwikutub Logam Untuk PEMFC Di Dalam Aplikasi Automotif</td>
<td>Member of Graduate Committee</td>
<td>Ongoing</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>2014-</td>
<td>Masniza Binti Mohamed @ Mahmood</td>
<td>Ekstraksi dan Penentuan Orthosiphon stamineus(OS) menggunakan hidropenyulingan yang dibantu Kesan Ohm</td>
<td>Main Supervisor</td>
<td>Ongoing</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>2014-</td>
<td>Lee Pak Hoe</td>
<td>Membran Penukar Proton Berasaskan Ko-polimer Berasaskan Polibenzimidakssole (Spbi) Bagi Aplikasi Sel Fuel For Fuel Cell Applications</td>
<td>Member of Graduate Committee</td>
<td>Ongoing</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>2013-</td>
<td>Syahir Bin Samuddin</td>
<td>Sistem Kawalan bagi Kenderaan Sel Fuel</td>
<td>Member of Graduate Committee</td>
<td>Ongoing</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>2013-</td>
<td>Nasrin Binti Sulaiman</td>
<td>Sistem Pengurusan Tenaga bagi Kenderaan Sel Fuel</td>
<td>Member of Graduate Committee</td>
<td>Ongoing</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>2013-</td>
<td>Lim Bee Huah</td>
<td>Reka Bentuk, Simulasi, Pembikinan dan Penilaian Prestasi Stel Sel Fuel membran penukar proton 5 kW</td>
<td>Member of Graduate Committee</td>
<td>Ongoing</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>2013-</td>
<td>Nurhazira Azly Binti Minhat</td>
<td>Sel Fuel Mikrobial</td>
<td>Chairman of Graduate Committee</td>
<td>Withdrawn</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>2013-</td>
<td>Tahereh Jafari</td>
<td>A Novel Technology for Hydrogen Production From Organics Matters in a Microbial Electrolysis Cell (MEC)</td>
<td>Main Supervisor</td>
<td>Ongoing</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Year</td>
<td>Name</td>
<td>Title</td>
<td>Role</td>
<td>Status</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>-------</td>
<td>--------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>-----------------------------</td>
<td>-----------</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>2013-</td>
<td>Suhaila Binti Abdullah</td>
<td>Peningkatan Pembelahan Molekul Air Fotoelektrokimia Dengan Pewarna Semulajadi Daripada Buah Naga</td>
<td>Member of Graduate Committee</td>
<td>Ongoing</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>2013-</td>
<td>Fathie Binti Ahmad Zakil</td>
<td>Kajian Dinamik Sel Fuel Langsung Metanol</td>
<td>Co-Supervisor</td>
<td>Ongoing</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>2012-</td>
<td>Liew Kien Ben</td>
<td>manganese oxide-carbon nanotubes nanocomposite as catalyst for oxygen reduction and POME treatment in microbial Fuel Cell</td>
<td>Chairman of Graduate Committee</td>
<td>Ongoing</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>2013-</td>
<td>Shiva Sadeghi Louyeh</td>
<td>Synthesis And Characterization Of Metal Coated Carbon Nanofiber For Hydrogen Storage</td>
<td>Co-Supervisor</td>
<td>Ongoing</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>2012-</td>
<td>Fathie Binti Ahmad Zakil</td>
<td>Dynamic studies of direct methanol fuel cell</td>
<td>Co-Supervisor</td>
<td>Ongoing</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>2012-</td>
<td>Suhaila Binti Abdullah</td>
<td>Synthesis and optimization of different type of fuel cells for different application</td>
<td>Member of Graduate Committee</td>
<td>Ongoing</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>2012-</td>
<td>Najua Delaila Binti Tumin</td>
<td>Kawalan Poliform Dan Penghabluran Asid Amino Dalam Pengerling Sembur Skala Perintis</td>
<td>Main Supervisor</td>
<td>Ongoing</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>2012-</td>
<td>Toh Shaw Yong</td>
<td>Sintesis dan Pencirian Elektromangkin Berasaskan Grafena Baru bagi Aplikasi Sel Fuel Melanol Langsung</td>
<td>Co-Supervisor</td>
<td>Ongoing</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>2012-</td>
<td>Leong Jun Xing</td>
<td>Novel nano-composite speek membrane in microbial fuel cell for waste water treatment and continuous power generation</td>
<td>Chairman of Graduate Committee</td>
<td>Ongoing</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>2012-</td>
<td>Haslina Binti Ahmad</td>
<td>Elektrod hibrid untuk sel fuel metanol dengan bantuan cahaya</td>
<td>Member of Graduate Committee</td>
<td>Ongoing</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>2011-</td>
<td>Norhafiz Bin Hashim</td>
<td>Rekabentuk, fabrikasi dan pengoptimuman sel fuel metanol langsung</td>
<td>Co-Supervisor</td>
<td>Ongoing</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>2011-</td>
<td>Azlyana Binti Ismail</td>
<td>Synthesis and Optimisation of Direct Methanol Fuel Cells via Cell Network</td>
<td>Co-Supervisor</td>
<td>Ongoing</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>2011-</td>
<td>Dang Sri Ayu Binti Abdul Halim</td>
<td>Biofilem dalam anod sel fuel mikrobial</td>
<td>Main Supervisor</td>
<td>Ongoing</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>2010-</td>
<td>Azran Bin Mohd Zainoodin</td>
<td>Lapisan Berliang Nanogentian Karbonuntuk Sokongan Elektrod Anod Dalam Sel Fuel Metanol Langsung Pasif</td>
<td>Member of Graduate Committee</td>
<td>Ongoing</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>2010 – 2013</td>
<td>Wong Wai Yin</td>
<td>Sintesis dan Pencirian Nanotub Karbon Terdop Nitrogen Sebagai Mangkin Katod untuk Aplikasi Sel Fuel</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>2010 - 2013</td>
<td>Thiam Hui San</td>
<td>Membran Nanokomposit Nafion/SiO2-Pd untuk Aplikasi Sel Fuel Metanol Langsung</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>2010-2015</td>
<td>Sahriah Binti Basri</td>
<td>Pembangunan Mangkin Berstuktur Nano Untuk Sel Fuel Metanol Langsung</td>
<td>Co-Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>2010-2014</td>
<td>Dedi Rohendi</td>
<td>Pembangunan Himpunan Elektrod Membran Ketumpatan Arus Tinggi</td>
<td>Co-Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Date</td>
<td>Name</td>
<td>Title</td>
<td>Supervisor</td>
<td>Status</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>------------</td>
<td>-----------------------</td>
<td>----------------------------------------------------------------------</td>
<td>------------------</td>
<td>-----------</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>2010-2015</td>
<td>Nurul Fitriah Binti Nasir</td>
<td>Pemodelan dan Pengoptimuman Proses Biodiesel Selanjur dan Sesekumpul Menggunakan Mangkin Homogen dan Heterogen</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>2009-2013</td>
<td>Mulyazmi</td>
<td>Pengembangan Metodologi Reka Bentuk Proses Sistem Sel Fuel Membran Penukaran Proton Untuk Pencapaian Prestasi Optimum</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>2009-2014</td>
<td>Erni Misran</td>
<td>Pemodelan dan Simulasi Pemindahan Air Di Sepanjang Alur Aliran Gas Sel Fuel Membran Penukar Proton</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>2009-2014</td>
<td>Asma M Husin Milad</td>
<td>Photocurrent Enhancement of Titania Nanotubular Arrays By Doped and Hetero Nanocomposite With Non Metal and Metal Oxide For Photoelectrochemical Water Splitting</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>2009-2009</td>
<td>Majid Talebi Esfandarani</td>
<td>Photocurrent enhancement of titania nanotubular arrays by doped and hetero nanocomposite with non metal and metal oxide for photoelectrochemical water splitting</td>
<td>Main Supervisor</td>
<td>Withdrawn</td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>2009-2013</td>
<td>Samaneh Keshani</td>
<td>Deposition of Sugar, Fat and Protein-Rich Food Materials in Pilot Scale Spray Drye</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>2009-2010</td>
<td>Soo Chan Wai</td>
<td>Producing hydrogen gas from salt water through radiofrequency</td>
<td>Co-Supervisor</td>
<td>Withdrawn</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>2008-2012</td>
<td>Nader Mokhtarian Mohammad Sadegh</td>
<td>Microbial Fuel Cells Development for Detection of Electrochemical Potential and Low Voltage Electricity</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>2008-2009</td>
<td>Mohd Shaiful Ramze Bin Endut</td>
<td>Crystallization Process of Pharmaceuticals and Macromolecules (Protein)</td>
<td>Main Supervisor</td>
<td>Withdrawn</td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>2008-2012</td>
<td>Ifa Puspasari</td>
<td>Hydrodynamic and Drying Characteristics of Oil Palm Frond Particles in An Agitated Fluidized Bed Dryer</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>2008-2013</td>
<td>Dedikarni Bin Panuh</td>
<td>Penyediaan dan Pencirian Sel Butang Tunggal Elektrolit Dwi Lapisan Sm0.3Ce0.71.5(SDC)/Y0.25Bi0.75O1.5(YSB) Bagi Sel Fuel Oksida Pepejal Bersu Sederhana dan Rendah</td>
<td>Co-Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>2008-2012</td>
<td>Khuzaimah Arifin</td>
<td>Kompleks Dwilogam Rutenium - Tungsten Sebagai Bahan Pemeka Pewarna Bagi Sel Fotoelektrokimia Pembelahan Molekul Air.</td>
<td>Co-Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>2008-2010</td>
<td>Fadhli Hadana Rahman</td>
<td>Fotoelektral Untuk Penghasilan Hidrogen</td>
<td>Co-Supervisor</td>
<td>Withdrawn</td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>2008-2012</td>
<td>Jarot Raharjo</td>
<td>Sintesis dan Pencirian Elektrolit C60Sm2O15(Li/Na)2CO3 Dengan Kaedah Pensinteran Tanda Tekanan Untuk Sel Fuel Oksida Pepejal Bersu Sederhana.</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>2006-2010</td>
<td>Mustafa I Fadhel</td>
<td>Studies on a Solar Assisted Chemical Heat Pump Dryer</td>
<td>Co-Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>2006-2010</td>
<td>Mohammad Ahmad Najib Batuha</td>
<td>Modelling The Environmental Fate and Impact of Non-Volatile Organic Agro-Chemicals</td>
<td>Co-Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>2006-2010</td>
<td>Mariam Firdhaus</td>
<td>Microwave-Assisted Drying of Pitaya</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>No. Year</td>
<td>Name</td>
<td>Title</td>
<td>Supervisor</td>
<td>Status</td>
<td></td>
</tr>
<tr>
<td>----</td>
<td>----------</td>
<td>------</td>
<td>-------</td>
<td>------------</td>
<td>--------</td>
<td></td>
</tr>
<tr>
<td>51</td>
<td>2006-2009</td>
<td>Binti Mad Nordin</td>
<td>(Hylocereus) Slices</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>52</td>
<td>2006-2014</td>
<td>Umi Azmah Asran</td>
<td>Pembangunan Sel Fuel etanol Langsung (DMFC) Mikro dengan Teknologi Sistem Mikro-Elektro-Mekanikal (MEMS)</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>53</td>
<td>2006-2012</td>
<td>Loma Binti Jeffery Minggu</td>
<td>Pembelahan Air Fotoelektrokimia dengan Semikonduktor Oksida Logam dalam Sistem Fotoreaktor</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>2004-2010</td>
<td>Mahreni Akhmad</td>
<td>Sintesis dan Penggunaan Membran Komposit Sebagai Elekrolit Sel Fuel Membran Penukar Proton</td>
<td>Co-Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>2004-2007</td>
<td>Yusri bin Yusup</td>
<td>Struktur Lapisan Permukaan Atmosfera di Kawasan Perinudtrian Khatulistiwa</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>56</td>
<td>2004-2008</td>
<td>Rosnah Bt Shamsudin</td>
<td>Sifat-Sifat Fizikal-Kimia, Termal, Mekanikal dan Reologi Ananas Comosus l (Varieti Josaphine)</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>57</td>
<td>2004-2010</td>
<td>Tjukup Marnoto</td>
<td>Reka Bentuk, Operasi Dan Kawalan Untuk Sistem Tenaga Hidrogen Suria Tersambung Grid</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>2004-2012</td>
<td>Nomizar Bt Anuar</td>
<td>Behaviour of Aqueous Solution, Crystallisation and Characterisation of L-isoleucine.</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>59</td>
<td>2004-2009</td>
<td>Shahnaz Mansouri Jajaie</td>
<td>Extraction of Essential Oils From Herbs using Supercritical Fluid Method</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>2002-2005</td>
<td>Ramli Sitanggang</td>
<td>Pembuatan Himpunan Elektrod Membran Sel Bahan Api Menggunakan Kaedah Semburan</td>
<td>Co-Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>62</td>
<td>2002-2003</td>
<td>Haider Mahmood Al-Mahdi</td>
<td>Optimization of MEA Coating Process By Screen Printing</td>
<td>Main Supervisor</td>
<td>Withdrawn</td>
<td></td>
</tr>
<tr>
<td>63</td>
<td>2002-2010</td>
<td>T.Husaini</td>
<td>Membran Reaktor Penghasilan Gas Hidrogen</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>64</td>
<td>2002-2005</td>
<td>Siti Kartom Bt Kamarudin</td>
<td>Sintesis Proses dan Reka Bentuk Optimum Untuk Rangkaian Reaktor-Pemisah Menggunakan Kaedah Algoritma</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>2002-2005</td>
<td>M. Rusli Yosfiah</td>
<td>Model Kinetik dan Pengoptimuman Penghasilan Gas Hidrogen Daripada Metanol dengan Menggunakan Mangkin Ni, Cu, Mo/Gamma Al₂O₃</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>2001-2004</td>
<td>Muhammad Yahya</td>
<td>Sistem Penyahlembapan Terbantu Suria untuk Herba Perubatan</td>
<td>Co-Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>67</td>
<td>2002-2007</td>
<td>Edy Herianto</td>
<td>Penulenan Gas Hidrogen Menggunakan Sistem Jerapan Buaian Tekanan Terpadat Untuk Sel Bahn Api</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>68</td>
<td>1999-2003</td>
<td>Bambang Trisakti</td>
<td>Pengeringan Terpilih Serbuk</td>
<td>Main Supervisor</td>
<td>Withdrawn</td>
<td></td>
</tr>
<tr>
<td>69</td>
<td>1999-2003</td>
<td>Rosdanelli Hasibuan</td>
<td>Pengeringan Gentian Tandan Kosong Kelapa Sawit Menggunakan Sistem</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Period</td>
<td>Student</td>
<td>Title of Thesis</td>
<td>Supervisory role</td>
<td>Status of student</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>------------</td>
<td>----------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>---------------------</td>
<td>---------------------</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>1999–2002</td>
<td>Yeoh Hak Koon</td>
<td>Kajian Fotoelektrod Tersensitiasi Pewarna Untuk Pengeluaran Hidrogen Melalui Fotoelektrolisis-tidak-terbantu Air</td>
<td>Main Supervisor</td>
<td>Withdrawn</td>
<td></td>
</tr>
<tr>
<td>71</td>
<td>1999–2003</td>
<td>Law Chung Lim</td>
<td>Pembendaliran: Hidrodinamik dan Penggunaannya dalam Proses Pengerangan</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>72</td>
<td>1998–2002</td>
<td>Muhammad Turmuzi</td>
<td>Pembuatan Karbon Teraktif dan Karbon Penapis Molekul daripada Tempurung Buah Keras</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>73</td>
<td>1998–2002</td>
<td>Taslim</td>
<td>Fenomena Pengangkutan Aliran Berayun dalam Turus Berosesekat</td>
<td>Co-Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>74</td>
<td>1997–2001</td>
<td>Ye Lwin @ Mohammed Husein</td>
<td>Characterization of Cu-Al Hydrotalcite-Derived Mixed Oxide for Hydrogen Production by Steam-Methanol Reforming</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>1997–2000</td>
<td>Supranto</td>
<td>Reka Bentuk dan Penilaian Sistem Pengerihan Terbantu Suria Dua Lalu dengan Media Berliang</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>76</td>
<td>1997–2002</td>
<td>Widayanti</td>
<td>Fenomena Pengelutan Zarahdari Turus Lapisan Terbendalir</td>
<td>Co-Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>77</td>
<td>1997–1998</td>
<td>Gunarto</td>
<td>Pemodelan Matematik Sistem Penjerapan Bualan Suhu</td>
<td>Main Supervisor</td>
<td>Withdrawn</td>
<td></td>
</tr>
<tr>
<td>78</td>
<td>1996–2002</td>
<td>Meor Zainal Bin Meor Talib</td>
<td>Pemodelan dan Simulasi untuk Sel Bahan Api bermembran Elektroli Polimer</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>79</td>
<td>1996–2001</td>
<td>Tim Mar Kyi</td>
<td>Drying with Chemical Reaction in Cocoa Bean Drying</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>1996–1996</td>
<td>Muhammad Niazul Haque Sarker</td>
<td>Design of Proton Exchange Membrane Fuel Cell Stack</td>
<td>Main Supervisor</td>
<td>Withdrawn</td>
<td></td>
</tr>
<tr>
<td>82</td>
<td>1996–1996</td>
<td>Abdul Salam Uheida</td>
<td>Novel Gas Diffusion Electrode for Proton Exchange Membrane Fuel Cell</td>
<td>Main Supervisor</td>
<td>Withdrawn</td>
<td></td>
</tr>
<tr>
<td>83</td>
<td>1995–1999</td>
<td>Sunny Iyuke Esayegbemu</td>
<td>Pressure Swing Adsorption of Hydrogen</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>84</td>
<td>1992–1996</td>
<td>Sam Myint</td>
<td>Extraction of Eugenol from clove</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>85</td>
<td>1989–1994</td>
<td>Mahamad Hakimi Ibrahim</td>
<td>Drying of Oil Palm Kernels</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>86</td>
<td>1988–1990</td>
<td>Ibrahim Shouib</td>
<td>Numerical Simulation of a Rotating Boiler</td>
<td>Main Supervisor</td>
<td>Withdrawn</td>
<td></td>
</tr>
</tbody>
</table>

**List of MSc Students' Thesis**

<table>
<thead>
<tr>
<th>No.</th>
<th>Period</th>
<th>Student</th>
<th>Title of Thesis</th>
<th>Supervisory role</th>
<th>Status of student</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2016</td>
<td>Ahmad Tajuddin Bin Abdullah</td>
<td>Sel Fuel Membran Penukaran Proton (Pemfc) Sistem Penyejukan Air</td>
<td>Member of Graduate Committee</td>
<td>Ongoing</td>
</tr>
<tr>
<td>#</td>
<td>Year</td>
<td>Name</td>
<td>Title</td>
<td>Role</td>
<td>Status</td>
</tr>
<tr>
<td>----</td>
<td>--------</td>
<td>------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>-------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>2</td>
<td>2016</td>
<td>Shuaiba Binti Samad</td>
<td>Mangkin DMFC</td>
<td>Co-Supervisor</td>
<td>Ongoing</td>
</tr>
<tr>
<td>3</td>
<td>2015</td>
<td>Mohd Azri Ahmad</td>
<td>Stainless steel electrode for MFC</td>
<td>Main Supervisor</td>
<td>Ongoing</td>
</tr>
<tr>
<td>4</td>
<td>2014-</td>
<td>Siti Mariam Bt. Daud Mangkin</td>
<td>Screening Of Earthen Ware And Ceramic Membrane As A Separator In Microbial Fuel Cell</td>
<td>Chairman of Graduate Committee</td>
<td>Ongoing</td>
</tr>
<tr>
<td>6</td>
<td>2014-</td>
<td>Badrulzamin Bin Mohd Yassin</td>
<td>Mengkuang Composite for car bodies</td>
<td>Co-Supervisor</td>
<td>Ongoing</td>
</tr>
<tr>
<td>7</td>
<td>2013-</td>
<td>Mohd Azwan Bin Husin</td>
<td>Penggunaan bahan eco-komposit (komposit diperkuat gentian mengkuang)untuk komponen badan keruang untuk komponen badan keruang untuk Komponen Carbon Katil</td>
<td>Member of Graduate Committee</td>
<td>Ongoing</td>
</tr>
<tr>
<td>8</td>
<td>2013-</td>
<td>Muhamad Norfais Bin Faisal</td>
<td>Converter And Control Design For Fuel Cell Hybrid Electric Vehicle Application</td>
<td>Co-Supervisor</td>
<td>Ongoing</td>
</tr>
<tr>
<td>10</td>
<td>2013-</td>
<td>Soo Li Ting</td>
<td>Sintesis dan Encrptian Elektromangkin Berasaskan Logam Peralihan dan Nitrogen Didopkan Graf Untuk Tindak Balas Penurunan Oksigen</td>
<td>Member of Graduate Committee</td>
<td>Ongoing</td>
</tr>
<tr>
<td>11</td>
<td>2013-</td>
<td>Norsyaidatul Binti Ibrahim</td>
<td>Production of Biomethanol from Photoelectrochemical reaction of Biomass</td>
<td>Member of Graduate Committee</td>
<td>Ongoing</td>
</tr>
<tr>
<td>12</td>
<td>2012-</td>
<td>Mumtazah Atiqah Binti Hassan</td>
<td>Development of sensor in DMFC</td>
<td>Chairman of Graduate Committee</td>
<td>Tukar ke PhD</td>
</tr>
<tr>
<td>13</td>
<td>2012-</td>
<td>Leong Jun Xing</td>
<td>Novel nano-composite speek membrane in microbial fuel cell for waste water treatment and continuous power generation</td>
<td>Main Supervisor</td>
<td>Finished</td>
</tr>
<tr>
<td>14</td>
<td>2012-2014</td>
<td>Liew Kien Ben</td>
<td>Manganese oxide-carbon nanotubes nanocomposite as catalyst for oxygen reduction and POME treatment in microbial Fuel Cell</td>
<td>Main Supervisor</td>
<td>Ongoing</td>
</tr>
<tr>
<td>16</td>
<td>2010-2015</td>
<td>Siti Afiaqah Binti Abd Hamid</td>
<td>Reka Bentuk Dan Pembangunan Sistem Pengurusan Kuasa Hibrid Sel Fuel, Superkapasitor, Dan Bateri Untuk Aplikasi Kenderaan</td>
<td>Main Supervisor</td>
<td>Finished</td>
</tr>
<tr>
<td>17</td>
<td>2010-2014</td>
<td>Ros Emilia Binti Rosli</td>
<td>Pembangunan Sistem Kawalan Hidrogen untuk Stek PEMFC</td>
<td>Co-Supervisor</td>
<td>Finished</td>
</tr>
<tr>
<td>19</td>
<td>2008-2009</td>
<td>Sahariah Binti</td>
<td>Pembangunan Peranti Reka Bentuk</td>
<td>Co-Supervisor</td>
<td>Withdrawn</td>
</tr>
<tr>
<td>No.</td>
<td>Year</td>
<td>Research Title</td>
<td>Supervisor</td>
<td>Status</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>---------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>---------------------</td>
<td>-----------------</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>2008 - 2010</td>
<td>Muhammad Shahid: Simulation of Complete Fuel Cell Systems</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>2008 - 2010</td>
<td>Norhafiz B Hashim: Rekabentuk Dan Fabrikasi Sel Fuel Mikro Metanol Langsung</td>
<td>Co-Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>2008-2010</td>
<td>Haslina Binti Ahmad: Membran Hibrid Nafion/Polibenzimidazol/Zirkonium Fosfat untuk Aplikasi SFML</td>
<td>Co-Supervisor</td>
<td>Withdrawn</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>2007 - 2009</td>
<td>Noorashrina Binti A Hamid: Pembangunan Katod La_xSr_yCo_o.2Fe_0.8O_3 (LSCF) Bagi Sel Fuel Oksida Pejal Bersuha Sederhana (IT-SOFC)</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>2004 – 2005</td>
<td>Wong Kuek Keong: CFD simulation of separtion</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>2003 - 2006</td>
<td>Khuzaimah Arifin: Sintesis Organik,Pencirian dan Kestabilan Foto Kompleks Tris(Diotelena) Tunsten</td>
<td>Co-Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>2003-2006</td>
<td>Fadhli Hadana Rahman: Sintesis Takorganik Kompleks Tris(Diotelena) Tunsten Sebagai Ftomangkin Bagi Fotolisis Air</td>
<td>Co-Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>2003-2006</td>
<td>Navriani Harahap: Kesan Tekanan Dalam Pengoptimuman Suhu Ke Atas Pembikinan Himpunan Elektrod Membran</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>2002 - 2004</td>
<td>Zahiruddin Bin Mohamed: Kesan Suhu Tinggi ke Atas Hidrodinamik Pembendaliran dan Pengirigan Zarah Dalam Lapisan Terbendalir</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>2002 - 2005</td>
<td>Efradi Adam Musa: Heat Transfer in Proton Exchange Membrane Fuel Cell</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>2002 - 2004</td>
<td>Azman Yazid: Reka Bentuk Konsep Sistem Sel Bahan Api Elektrolt Polimer dengan Modul Membran Seramik Menggunakan Perisian Simulasi Proses HYSYS</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>2002 - 2004</td>
<td>Masli Irwan Bin Rosli: Prestasi Sel Bahan Api Membran Pertukaran Proton - Pemilihan Reka</td>
<td>Main Supervisor</td>
<td>Finished</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Tahun</td>
<td>Nama Sukan</td>
<td>Isu Penyelidikan</td>
<td>Ujian</td>
<td>Status</td>
</tr>
<tr>
<td>-----</td>
<td>-------</td>
<td>------------</td>
<td>------------------</td>
<td>-------</td>
<td>--------</td>
</tr>
<tr>
<td>39</td>
<td>2002-2004</td>
<td>Mimi Hani Binti Abu Bakar</td>
<td>Proses Penyediaan Mangkin Platinum di atas Substrat Karbon Terakrif Tempatan Menggunakan Teknik Isitepu</td>
<td>Main</td>
<td>Finished</td>
</tr>
<tr>
<td>40</td>
<td>2002-2003</td>
<td>Mohd Shahbudin Bin Mastar @Masdar</td>
<td>Pembangunan Model Matematik dan Kajian Parameter Sel Bahan Api Membran Elektrolit Polimer</td>
<td>Co-Supervisor</td>
<td>Finished</td>
</tr>
<tr>
<td>41</td>
<td>2002-2004</td>
<td>Nik Suhaimi Bin Mat Hassan</td>
<td>Pembangunan Model Matematik bagi Pemindahan Jisim Air dalam Sel Bahan Api Membran Elektrolit Polimer</td>
<td>Main</td>
<td>Withdrawn</td>
</tr>
<tr>
<td>42</td>
<td>2002-2004</td>
<td>Mustafa I Fadil</td>
<td>Solar Hydrogen Production System</td>
<td>Co-Supervisor</td>
<td>Finished</td>
</tr>
<tr>
<td>43</td>
<td>2002 – 2005</td>
<td>Vickneswaran S/O M.Veloo</td>
<td>Optimization of Batch Drilling Fluids/Mud Mixing Plant</td>
<td>Main</td>
<td>Finished</td>
</tr>
<tr>
<td>44</td>
<td>2002 - 2004</td>
<td>Souiyah Miloud</td>
<td>Performance of Proton Exchange Membrane Fuel Cell with Interdigitated Flowfield</td>
<td>Co-Supervisor</td>
<td>Finished</td>
</tr>
<tr>
<td>45</td>
<td>2002 - 2004</td>
<td>Ng Pin Pin</td>
<td>Pengerigan Padi dalam Lapisan Terpancut</td>
<td>Co-Supervisor</td>
<td>Finished</td>
</tr>
<tr>
<td>46</td>
<td>2001-2004</td>
<td>Lorna Binti Jeffery Minggu</td>
<td>Penghasilan Hidrogen Daripada Pembentukan Semula Metanol</td>
<td>Main</td>
<td>Finished</td>
</tr>
<tr>
<td>47</td>
<td>2001 - 2003</td>
<td>Mohd Sabri Bin Mahmud</td>
<td>Penyediaan dan Pencirian Mangkin Cu-Zn-V-Al Dalam Pembentukan Semula Autoterma Metanol</td>
<td>Main</td>
<td>Withdrawn</td>
</tr>
<tr>
<td>48</td>
<td>2000 - 2002</td>
<td>Mohd Nahar Bin Othman</td>
<td>Pemusnahan Benzena (Bahan Organik Mudah Meruap) Menggunakan Kaedah Alur Elektron</td>
<td>Main</td>
<td>Finished</td>
</tr>
<tr>
<td>49</td>
<td>2000 – 2002</td>
<td>Abdol Salam Bin Nas Mohd Sariff</td>
<td>Pengoptimuman Proses Loji Pemprosesan Gas</td>
<td>Main</td>
<td>Finished</td>
</tr>
<tr>
<td>50</td>
<td>1999-2002</td>
<td>Eman Noori Ali</td>
<td>Sampling and Analysis of Volatile Organic Compounds in Ambient Air in Malaysia</td>
<td>Main</td>
<td>Finished</td>
</tr>
<tr>
<td>52</td>
<td>1999 - 2001</td>
<td>Islina Binti Kamaruzaman</td>
<td>Keseimbangan Jerapan Alkana-alkana Berberat Molekul Rendah Ke Atas Karbon Terakrif dan Penapis-Penapis Molekul</td>
<td>Main</td>
<td>Finished</td>
</tr>
<tr>
<td>53</td>
<td>1998 - 2000</td>
<td>Law Chung Lim</td>
<td>Pengiringan Bagi Zarah Halus Dari Pengelut Terbendalir Sesekumpul</td>
<td>Main</td>
<td>Finished</td>
</tr>
<tr>
<td>54</td>
<td>1999 - 2002</td>
<td>Norliza Binti Abd Rahman</td>
<td>Penalaan Pengawal Lazim PID ke Atas Menara Penyulingan Dengan Kaedah Logik Kabur</td>
<td>Main</td>
<td>Finished</td>
</tr>
<tr>
<td>55</td>
<td>1998 - 2000</td>
<td>Edy Herianto</td>
<td>Perjeraapan Sebatian Organik Mudah Meruap Menggunakan Sistem Jerapan Buaian Terma</td>
<td>Main</td>
<td>Finished</td>
</tr>
<tr>
<td>56</td>
<td>1998 - 2000</td>
<td>Chebbi Rachid</td>
<td>Fabrication of Low Platinum Loading Elektrode for Proton Exchange Membrane Fuel Cell System</td>
<td>Main</td>
<td>Withdrawn</td>
</tr>
<tr>
<td>57</td>
<td>1998 - 2000</td>
<td>Ma'an Fahmi Rashid Al Khatib</td>
<td>Surface Modification of Activated Carbon by Impregnation with SnCl2, H2O for for Purification of H2/CO Gas Mixture</td>
<td>Co-Supervisor</td>
<td>Finished</td>
</tr>
<tr>
<td>58</td>
<td>1997-1997</td>
<td>Loo Yong Eng</td>
<td>Pencirian Elektrodialiser</td>
<td>Main</td>
<td>Finished</td>
</tr>
<tr>
<td>No.</td>
<td>Year</td>
<td>Name</td>
<td>Title</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>------</td>
<td>-----------------------------</td>
<td>---------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2016</td>
<td>Norsyafika Binti Hassim</td>
<td>Permodelan Dan Simulasi Mikrobial Sel Fuel Untuk Penghasilan Kuasa Elektrik</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2016</td>
<td>Nur Amera Binti Mohamad Bakri</td>
<td>Permodelan dan simulasi sel mikrobil elektrolisis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2015</td>
<td>Ying Ying Ch'ng</td>
<td>Sintesis membrane komposit baru bagi kegunaan sel fuel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2015</td>
<td>Fatimah Azzahra</td>
<td>Sintesis membrane komposit baru bagi kegunaan sel fuel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>2014</td>
<td>Nurul Nadia Nga</td>
<td>Penyediaan, Pencirian Dan Pengujian Fotoelektrod Bagi Bateri Boleh Cas Semula</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>2014</td>
<td>Noor Zaiyan Misyan</td>
<td>Tindak balas fotokatalisis effuen kilang minyak sawit (POME) bagi penghasilan hidrogen hijau</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>2013</td>
<td>Tan Eng Lee</td>
<td>Membran polimer elektrolit berasaskan blok kopolimer untuk aplikasi sel fuel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>2013</td>
<td>Dahiyah Binti Mohd Fadzillah</td>
<td>Komposit membran asid pepejal untuk sel fuel bersuhi perantaraan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>2012</td>
<td>Mohd Kamaruzzaman Bin Mat Daud</td>
<td>Penganggaran Pekali Serapan Air yang Boleh-ubah daripada Data Kadar Pengeringan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>2012</td>
<td>Normalayati Binti Mahmud Raseh</td>
<td>Keterpilihan dan Ruang Pecapaan Metil Ester dan Gliserol dalam Tindak Balas Trans-Esterifikasi Pelbagai Minyak Makan dan Tak Boleh Dimakan bagi Menghasilkan Biodiesel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>2011</td>
<td>Norbaini Binti Bahtiar</td>
<td>Penentuan Saiz (Luas Permukaan) Membran dan Masa Proses bagi Modul Osmosis Terbalik Beraliran Silang yang Berkit Semula</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>2011</td>
<td>Mohamad Zulhairi Bin Ibrahim</td>
<td>Pemodelan dan Simulasi Rangkaian Kuasa Kereta Bugi Golf yang Dipacu Sel Fuel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>2010</td>
<td>Lee Seet Yee</td>
<td>Pemerangkapan Karbon Menggunakan Penjerapan Ke Atas Kapur</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>2010</td>
<td>Farhan Bin Mohd Pozi</td>
<td>Simulasi Aliran dalam Sel Fuel menggunakan CFD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Tahun</td>
<td>Penyelidik</td>
<td>Judul Masalah: Pengeringan produk lain dan Permodelan dan Simulasi loji Proses Kimia.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Tahun</td>
<td>Nama Penyelidik</td>
<td>Judul Penyelidikan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>-------</td>
<td>-----------------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>51</td>
<td>1999</td>
<td>Ahmad Firdaus Bin Mat Taib</td>
<td>Reologi Makanan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>52</td>
<td>1998</td>
<td>Azlan Kahalil</td>
<td>Pencirian dan Penoperasian Turus Penyulingan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>53</td>
<td>1998</td>
<td>Yong Hong Sin</td>
<td>Simulasi Aliran dalam Stek Sel Bahan Api</td>
<td></td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>1998</td>
<td>Khor Min Che</td>
<td>Pentauliahpan loji Pandu Ekstraksi</td>
<td></td>
<td></td>
</tr>
<tr>
<td>56</td>
<td>1998</td>
<td>Werry Lipi</td>
<td>Kesan Peratusan Zarah Halusus Atas Kebolehaliran Bahan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>57</td>
<td>1998</td>
<td>Nor Farhana Mohd Aris</td>
<td>Pengeringan Buah-Buahan Tempatan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>1998</td>
<td>Maizura Ibrahim</td>
<td>Penghasilan Hidrogen Daripada Metanol: Pencirian Mangkin Kuprum/Aluminium (III) dengan Penggalak Zn</td>
<td></td>
<td></td>
</tr>
<tr>
<td>59</td>
<td>1998</td>
<td>Seet Elaine</td>
<td>Perisian Analisis Risiko dalam Loji Pemprosesan Kimia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>1998</td>
<td>Chan Chee Wei</td>
<td>Rekabentuk Sel Elektrodialisis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>1998</td>
<td>Tee Yeow Fong</td>
<td>Pemncirian Mangkin Kuprum/Aluminium dengan Penggalak Mn dan Ch untuk Tindakbalas Penguraian Metanol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>62</td>
<td>1997</td>
<td>Rafezal Mohd Said</td>
<td>Pemilihan Pengekstrak Multi-komponen</td>
<td></td>
<td></td>
</tr>
<tr>
<td>63</td>
<td>1997</td>
<td>Azzuddin</td>
<td>Simulasi Pengerengan dengan Tindak balas Kimia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>64</td>
<td>1996</td>
<td>Yusniizam Yusof</td>
<td>Pemodelan Sel Bahan Api Polimer Pejal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>1996</td>
<td>Wan Suriati</td>
<td>Membran Sel Bahan Api Polimer Pejal Baru</td>
<td></td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>1996</td>
<td>Wong Kuek Keong</td>
<td>Pemodelan Pengeringan Lapisan Dalam Padi</td>
<td></td>
<td></td>
</tr>
<tr>
<td>67</td>
<td>1996</td>
<td>Nazri Ahmad</td>
<td>Simulasi Aliran Kucar-Kacir</td>
<td></td>
<td></td>
</tr>
<tr>
<td>68</td>
<td>1996</td>
<td>Enjang al Lanting</td>
<td>Ekstraksi Kucar Kacir</td>
<td></td>
<td></td>
</tr>
<tr>
<td>69</td>
<td>1995</td>
<td>Pang Tuck Seng</td>
<td>Simulasi Pemisahan Membran Gas dalam Gentian Berkelonsong</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>1995</td>
<td>Rosnah</td>
<td>Lokus Alah Padi pada Kandungan Lembapan Berlainan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>71</td>
<td>1995</td>
<td>Nordin Zakaria</td>
<td>Penghasilan Karbon daripada Tempurung Kelapa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>72</td>
<td>1995</td>
<td>Tan Chey Ling</td>
<td>Simulasi Dinamik Loji Ekstraksi Zirconium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>73</td>
<td>1994</td>
<td>Sivakumar Subramaniam</td>
<td>Reka bentuk Sistem Pembentuk Semula Stim</td>
<td></td>
<td></td>
</tr>
<tr>
<td>74</td>
<td>1993</td>
<td>Liew Siew Loon</td>
<td>Kembangan Pembentuk Semula untuk Menghasilkan Hidrogen drpd Gas Asli &amp; Stim</td>
<td></td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>1993</td>
<td>Chong Loong How</td>
<td>Lokus Alah Biji Koko pada Kandungan Lembapan Berlainan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>76</td>
<td>1993</td>
<td>Amiruddin Abd. Hamid</td>
<td>Pengering Koko Lapisan Bergetar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>77</td>
<td>1993</td>
<td>Cheah Chee Mun</td>
<td>Luahan Hidrokarbon MultiKomponen Bertekanan Atas Takat Didith</td>
<td></td>
<td></td>
</tr>
<tr>
<td>78</td>
<td>1993</td>
<td>Samah Che Lamin</td>
<td>Kembangan Motor Roket Berbahan Dorong Pepejal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>1992</td>
<td>Azhar Ahmad</td>
<td>Simulasi Tumpahan Minyak</td>
<td></td>
<td></td>
</tr>
<tr>
<td>83</td>
<td>1992</td>
<td>Rohana Ahmad</td>
<td>Ekstraksi Ytterrium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>84</td>
<td>1992</td>
<td>Liza bt. Jaafar</td>
<td>Kesan Pengeringan Terhadap Tindakbalas 'Browning' Koko</td>
<td></td>
<td></td>
</tr>
<tr>
<td>85</td>
<td>1992</td>
<td>Lee Hong Tein</td>
<td>Simulasi Monte Carlo Model Tumpahan Minyak dalam Lautan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>87</td>
<td>1992</td>
<td>Farok b. Maasom</td>
<td>Pengeringan Terbendalir Arang Batu Malaysia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>88</td>
<td>1991</td>
<td>Halimahton bt. Baharum</td>
<td>Penskalaan Naik Penghasilan Kitin daripada Kulit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Tahun</td>
<td>Nama Pengarah</td>
<td>Judul Karya</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>-------</td>
<td>---------------</td>
<td>-------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>89</td>
<td>1991</td>
<td>Badariah bt. Manab</td>
<td>Penskalaan Naik Penghasilan Bromelin dari Batang Nenas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>1991</td>
<td>Ropandi b. Mamat</td>
<td>Pengekstrakan Torium dengan Turus Ekstraksi Terpadat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>91</td>
<td>1989</td>
<td>Kamaroulzaman b. Thith</td>
<td>Pengoptimuman Penghasilan Bromelin daripada Batang Nenas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>94</td>
<td>1989</td>
<td>Bita ak Ata</td>
<td>Simulasi Pengering Kernel Kelapa Sawit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>95</td>
<td>1989</td>
<td>Yusof Darus</td>
<td>Penggunaan AutoCad dalam Penyusunan Loji</td>
<td></td>
<td></td>
</tr>
<tr>
<td>96</td>
<td>1988</td>
<td>Gerard Wang Chee Shoon</td>
<td>Dinamik dan Kawalan Penyejat Filem Memanjat QVF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>97</td>
<td>1988</td>
<td>Raveentiram Krishna</td>
<td>Rekabentuk Rig bagi Penghidrogenan Selanjar Kelapa Sawit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>98</td>
<td>1988</td>
<td>Norsham bt. Nordin</td>
<td>Ciri Pengeringan Padi</td>
<td></td>
<td></td>
</tr>
<tr>
<td>99</td>
<td>1988</td>
<td>Wan Othman b. Wan Yahya</td>
<td>Simulasi Kawalan Fermentor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>1988</td>
<td>Siti Fatimah bt. Hj. Abd. Rashid</td>
<td>Kinetik Pengeringan Kelapa Sawit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>102</td>
<td>1987</td>
<td>Mut Sagai</td>
<td>Pengaturcaraan Rekabentuk Menara Penyulingan Berplat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>103</td>
<td>1987</td>
<td>D. S. Krishana Rao</td>
<td>Pembangunan Proses Pemisahan Bromelin daripada Batang Nenas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>104</td>
<td>1986</td>
<td>Othman Darus</td>
<td>Rekabentuk Proses Pengeringan Lapisan terpancut</td>
<td></td>
<td></td>
</tr>
<tr>
<td>105</td>
<td>1986</td>
<td>Goh Eng Hooi</td>
<td>Ciri-Ciri Injap Kawalan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>107</td>
<td>1986</td>
<td>Suhaimi b. Said</td>
<td>Rekabentuk Terbantu Komputer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>108</td>
<td>1986</td>
<td>P. Govindasamy</td>
<td>Pemprosesan Kitin daripada Kulit Udang</td>
<td></td>
<td></td>
</tr>
<tr>
<td>109</td>
<td>1985</td>
<td>Beh Kok Chuan</td>
<td>Penyediaan Rajahaliran Proses dengan Kaedah Komputer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>110</td>
<td>1985</td>
<td>Ku Halim Ku Hamid</td>
<td>Reologi Kanji Beras Digelatin pada Suhu Rendah</td>
<td></td>
<td></td>
</tr>
<tr>
<td>111</td>
<td>1985</td>
<td>Zakaria Omar</td>
<td>Penyelesaian Berangka Persamaan Pengeringan Bahan Berliang</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>