

ABSTRAK

PENGARUH TEMPERATUR & WAKTU PERENDAMAN PADA *CLADDING TUBES* MATERIAL (Fe-9Cr-5Al-1W-0.35Ti- 1Zr-0.35Y₂O₃-0.01C) DI LINGKUNGAN TIMBAL TERHADAP KOMPOSISI, SIFAT MEKANIS & STRUKTUR MIKRO

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Penelitian ini bertujuan untuk mengetahui pengaruh variasi temperatur dan waktu perendaman terhadap struktur mikro, komposisi, dan nilai kekerasan *vickers* material *ODS Steel* (Fe-9Cr-5Al-1W-0.35Ti-1Zr-0.35Y₂O₃-0.01C) dalam lingkungan timbal jenuh oksigen. Proses sintesis material dilakukan dengan metode metalurgi serbuk dengan *milling* 8 jam pada 600 rpm, kemudian dikompaksi pada tekanan 300 MPa, dan sintering pada temperatur 1200°C selama 2 jam. Sampel diuji pada temperatur 400°C dan 600°C dengan variasi waktu perendaman selama 25, 100, dan 400 jam. Karakterisasi dilakukan menggunakan *Optical Microscope* (OM), *Scanning Electron Microscope-Energi Dispersive Spectroscopy* (SEM-EDS), *X-Ray Diffraction* (XRD), dan pengujian kekerasan dengan *Macro Vickers Hardness Test*. Hasil pengujian menunjukkan bahwa peningkatan temperatur dan waktu perendaman menyebabkan pembesaran ukuran butir, pembentukan lapisan oksida, serta penurunan nilai kekerasan. Fasa major yang terbentuk pada material adalah α -Fe kemudian lapisan oksida yang terbentuk beragam seperti Fe₃O₄, Spine Fe-Cr dan Fe-Al, serta Al₂O₃. Ketebalan oksida meningkat seiring dengan peningkatan temperatur dan lamanya waktu perendaman. Hal ini menunjukkan bahwa material *ODS Steel* memiliki ketahanan korosi yang baik, namun tetap mengalami degradasi pada kondisi yang ekstrem.

Kata kunci: FeCrAl *ODS*, korosi suhu tinggi, lingkungan timbal jenuh oksigen

ABSTRACT

THE EFFECT OF TEMPERATURE AND SOAKING TIME ON CLADDING TUBES MATERIAL (Fe-9Cr-5Al-1W-0.35Ti-1Zr- 0.35Y2O3-0.01C) IN LEAD ENVIRONMENT ON COMPOSITION, MECHANICAL PROPERTIES & MICROSTRUCTURE

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This study aims to determine the effect of variations in temperature and immersion time on the microstructure, composition, and Vickers hardness value of ODS Steel (Fe-9Cr-5Al-1W-0.35Ti-1Zr-0.35Y2O3-0.01C) in an oxygen-saturated lead environment. The material synthesis process was carried out using a powder metallurgy method with 8 hours of milling at 600 rpm, then compacted at a pressure of 300 MPa, and sintering at a temperature of 1200°C for 2 hours. Samples were tested at temperatures of 400°C and 600°C with variations in immersion time for 25, 100, and 400 hours. Characterization was carried out using an Optical Microscope (OM), Scanning Electron Microscope-Energy Dispersive Spectroscopy (SEM-EDS), X-Ray Diffraction (XRD), and hardness testing with a Macro Vickers Hardness Test. The test results show that increasing temperature and immersion time causes an increase in grain size, the formation of an oxide layer, and a decrease in hardness. The major phase formed in the material is α -Fe, followed by various oxide layers such as Fe₃O₄, Fe-Cr and Fe-Al Spines, and Al₂O₃. The oxide thickness increases with increasing temperature and immersion time. This indicates that the ODS Steel material has good corrosion resistance, but still experiences degradation under extreme conditions..

Keywords: FeCrAl ODS, high temperature corrosion, oxygen saturated lead environment