

ABSTRAK

Lokasi penelitian secara administratif terletak di Daerah Songgoriti, Kota Batu, Kabupaten Malang, Provinsi Jawa Timur sedangkan secara astronomi berada pada $7^{\circ} 52' 15''$ LS, $112^{\circ} 28' 10''$ BT - $7^{\circ} 49' 54''$ LS, $112^{\circ} 32' 31''$ BT atau pada sistem UTM zona 49S: X. 9126000mU–9134000mU dan Y. 662000mT–670000mT. Studi panasbumi pada daerah penelitian berdasarkan geologi dan analisis geokimia, data yang digunakan dalam penelitian ini meliputi data empirik (pendekatan data lapangan meliputi pengamatan lapangan, geologi regional dan kondisi geologi lokal, dan pengambilan contoh batuan) dan metode analitik (analisis petrografi dan analisis geokimia fluida, pengambilan contoh batuan).

Daerah penelitian termasuk dalam kerangka tektonik dengan jalur magmatic (*magmatic arc*) pada lajur Gunungapi Kuartir Jawa Timur termasuk Komplek Gunungapi Kawi-Butak yang merupakan gunungapi tipe strato dan secara geografis terletak di Ada tiga gunung yang berada di wilayah penelitian yaitu Gunung Panderman (2.045 mdpl), Gunung Welirang (3.156 mdpl), dan Gunung Arjuna (3.339 mdpl). Satuan geomorfik menurut klasifikasi Van Zudiam (1983) yaitu Kawah Vulkanik (V1), Lereng Vulkanik Atas (V2), Lereng Vulkanik Tengah (V5), Kaki Vulkanik Gunung Panderman (V6), Kaki Vulkanik Gunung Anjuna-Anjasmara (V7), dan Dataran Antar Vulkanik (V12), dengan pola pengaliran subdendritik dan pola pengaliran parallel dan daerah Songgoriti terdapat 6 satuan litologi yang ada di lereng utara Gunung.Panderman itu antara lain Satuan Breksi Laharik Anjasmara Tua (Qpat), Satuan Breksi Vulkanik Anjasmara Muda (Qpva), Satuan Tuf Kawi-Butak (Qpkb), Satuan Tuf Arjuna-Welirang (Qvaw), Satuan Breksi Vulkanik Panderman (Qvp) dan Endapan Aluvial (Qa).

Manifestasi panasbumi daerah Songgoriti terdapat 5 (lima) zona keluaran mataair panas pada celah batuan vulkanik berupa breksi laharik dan ditandai dengan adanya oksidasi, dicirikan dengan berwarna kekuningan, sedikit berbau belerang, bertemperatur $31.2-48.2^{\circ}\text{C}$, pH netral 6.66-7.29, elevasi tinggi > 850 mdpl, debit air 0.085-1 l/detik . Berdasarkan diagram segitiga Cl-SO₄-HCO₃ mata air panas Songgoriti bertipe klorida yang dominan, diagram segitiga Na-K-Mg umumnya berada pada zona *immature waters* dan pendugaan temperature reservoir berada pada kisaran $200-220^{\circ}\text{C}$ yang termasuk dalam sistem panasbumi enthalpi sedang ($T=125-225^{\circ}\text{C}$), diagram segitiga Cl- Li-B menunjukkan lingkungan pemunculan berada pada batuan vulkanik, Diagram piper memperlihatkan mata airpanas Songgoriti berada pada zona “*primary geothermal fluida*”, dan dari hasil perhitungan *geothermometer* dengan menggunakan metode Na/K (Giggenbach, 1988) didapatkan temperature reservoir $202.48-221.95^{\circ}\text{C}$.

Kata Kunci : Vulkanik Kuartir, Alterasi hidrotermal, Manifestasi Panas bumi.

ABSTRACT

The research location is administratively located in Songgoriti District, Batu City, Malang Regency, East Java Province. Astronomically the research area is located within zones: south latitude $7^{\circ} 49' 54'' - 7^{\circ} 52' 15''$ and east longitude $112^{\circ} 28' 10'' - 112^{\circ} 32' 31''$ or within UTM zone 49S : X. 9126000mU–9134000mU and Y. 662000mT–670000mT. The research area included in Kawi-Butak Volcano Complex which has strato volcano type. The research location is geographically located on Mount Panderman (2.045 masl), Mount Welirang (3.156 masl), and Mount Arjuno (3.339 masl). Based on geological data and geo-chemical analysis, empirical data and analytical data is used for geothermal study in research area. Empirical data is an approach to field data including field observations, local geology and regional geology conditions, and rock sampling. While analytical methods include petrographic analysis and fluid geo-chemical analysis. Rock sampling is used to determine the type of rock and changes in rocks through geothermal fluid. Fluid sampling (water) is used to determine the fluid origin, the type of fluid, and upflow or outflow zone.

From the results of the study in research area has 6 geomorphic units according to Van Zuidam classification (1983) namely Volcanic Crater (V1), Upper Volcanic Slope (V2), Middle Volcanic Slope (V5), Mount Panderman Volcanic Foot (V6), Mount Anjuna-Anjasmara Volcanic Foot (V7), and The Inter-Volcanic Plain (V12). The research area has sub-dendritic flow pattern and parallel flow pattern.

From the observations of rocks, there are 6 lithology on the northern slope of Mount Panderman, Old Lava Breccia Anjasmara (Qpat), Early Volcanic Breccia Anjasmara (Qpva), Kawi-Butak Tuff (Qpkb), Arjuna-Welirang Tuff (Qvaw), Volcanic Breccia Panderman (Qvp) and Aluvial Sediment (Qa). The research area is included in the magmatic arc in tectonic setting in the East Java Quaternary Volcano Line.

Geothermal manifestations in the Songgoriti District are characterized by the appearance of 5 hot springs and are located in gap of volcanic rock in the form of lava breccia and are characterized by oxidation. The manifestations in Songgoriti District are characterized by yellowish hot springs, slightly sulfurous, temperature with a neutral PH (6.3-6.46), high elevation > 850 masl, water discharge 0.12-1 l/second. Based on triangle diagram Cl-SO₄-HCO₃ the Songgoriti hot springs has the dominant chloride type, while triangle diagram Na-K-Mg generally in the immature waters zone and the estimated reservoir temperature is in the range 200-220°C which is included in the medium enthalpy geothermal system (T=125-225°C), the Cl- Li-B triangle diagram shows the emergence environment is in volcanic rocks, piper diagram shows the Songgoriti hot springs is in primary geothermal fluids zone, and from the results of the calculation of the geo-thermometer using Na/K method (Giggenbach, 1988) obtained a reservoir temperature of 202-222°C.

Keywords : Quarter Volcanic, Hydrothermal Alteration, Geothermal Manifestations