Studi hidrogeokimia lapangan panas bumi Gunung Lawu, Jawa Tengah = Hydrogeochemistry study of Gunung Lawu geothermal field, Central Java.

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Abstrak

Sistem panas bumi Gunung Lawu merupakan salah satu prospek panas bumi yang terletak di antara Jawa Tengah dan Jawa Timur. Pada tahap eksplorasi, survei geokimia merupakan salah satu survei yang harus dilakukan. Survei tersebut mencakup studi hidrogeokimia. Studi hidrogeokimia penting untuk menentukan suhu reservoir, asal usul sistem panas bumi, dan mekanisme sirkulasi fluida. Tujuan penelitian adalah menentukan karakteristik hidrogeokimia lapangan panas bumi Gunung Lawu, Jawa Tengah. Metode penelitian terdiri dari beberapa tahapan, yaitu tahap pendahuluan meliputi studi literatur, pengumpulan data meliputi data geologi, citra satelit, dan geokimia. Selanjutnya, tahap analisis data mencakup analisis kation, anion, dan isotop pada tiap sampel air. Daerah penelitian merupakan sistem relief tinggi. Daerah penelitian mempunyai delapan manifestasi permukaan panas bumi dengan suhu manifestasi berkisar 40-58 ºC, pH 2 dan 6. Empat mata air dingin dengan suhu berkisar 15-25 ºC dan pH 7. Manifetasi permukaan panas bumi memiliki tipe air beragam, yaitu sulfat, klorida, bikarbonat, dan dilute klorida-bikarbonat. Selain itu, air dingin didominasi oleh tipe air bikarbonat. Berdasarkan analisis geoindikator, zona upflow berada di titik manifestasi LWU, sedangkan zona outflow berada di titik manifestasi PBL atau JNW. Sistem panas bumi daerah penelitian memiliki suhu reservoir sekitar 160-170 ºC dan termasuk ke dalam klasifikasi sistem entalpi tinggi. Sumber air panas bumi daerah penelitian berasal dari air meteorik (SGN 1 dan NGT) dan air campuran (PBL, BNA, dan LWU) melalui analisis isotop. Berdasarkan ciri atau aspek geologi dan geokimia, daerah penelitian termasuk ke dalam sistem geothermal play convection dominated tipe CV-1. Luaran akhir penelitian ini adalah model konseptual hidrogeokimia lapangan panas bumi Gunung Lawu.

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Gunung Lawu geothermal system is one of a geothermal prospect where is located between Central and East Java. In the exploration stage, geochemistry survey must be conducted. The survey covers hydrogeochemistry study. Hydrogeochemistry study is important to determine reservoir temperature, origin of the geothermal system, and fluid recharge mechanism. The research aims to determine the hydrogeochemical characteristics of Gunung Lawu geothermal field, Central Java. The research method consists of several stages, the preliminary stage cover literature study, data collection covers geological data, satellite imagery, and geochemistry. Furthermore, data analysis covers the analysis of cations, anions, and isotope in each water sample. The research area is a high relief system. The research area has eight geothermal surface manifestations with temperatures 40-58 ºC, pH 2 and 6. Four cold water has a temperature from 15-25 ºC and pH 7. The surface manifestation has various water types are sulfate, chloride, bicarbonate, and dilute chloride-bicarbonate. Moreover, cold water is dominated by bicarbonate water types. Based on geoindicator analysis, the upflow zone is located in LWU, while the outflow zone is located in PBL or JNW. The geothermal system in the study area has a reservoir temperature of around 160-170ºC and is included in a high enthalpy system classification. The geothermal water in the study area is

originated from meteoric water (SGN 1 and NGT) and mixed water (PBL, BNA, and LWU) through isotope analysis. Based on geology or geochemistry aspect, the research area include in convection dominated CV-1 type of geothermal play. The final output of this research is the hydrogeochemical model of the Gunung Lawu geothermal field.