

ABSTRACT

The volcanic lines of Bawean – Muria with southwest - northeast direction, belong to Pleistocene – Holocene volcanic; are located in the southeastern part of Cretaceous granite in the Java Sea, and more far away from recent subduction zone. The result of seismic data interpretation of bedrock Pra-Paleogene and Paleogene-Neogene sedimentary rocks, it shows a connection that is marked by the similarity of azimuth direction on Pra-Paleogene – Paleogene - Neogene. Based on the relationship of these tectonics formed the lines of kitchen (sub-basin), migration direction and hydrocarbon trap at Pati Basin.

The other evidence of Bawean - Muria volcanic lines are composition of major elements, trace elements and minerals composition that show the genetic magmas of calc-alkaline and shoshonite. The rocks of Muria Volcano compose of SiO_2 (45 -60%) and $\text{K}_2\text{O} + \text{Na}_2\text{O}$ (6 - 14%) that belong to alkaline magma type f to intermediate; generally are phonotepite, basaltic trachyandesite and phonolite. At Bawean Island, it shows SiO_2 (50 - 60%) and $\text{K}_2\text{O} + \text{Na}_2\text{O}$ (7- 18%) also appear in alkaline magma to intermediate; that is composed by e phonotephrite, teperiphonolite and phonolite. The plot result of Harker Diagram (SiO_2 versus other major elements); AFM and SiO_2 versus FeO^/MgO shows that the volcanic at Bawean Island and Muria Volcano are distributed from low to high-K and in general they are within leusitic ultrapotassic magmas and their rock types are basalt, andesite basalt and andesite.*

The result of trace element analysis on a diagram of Zr versus Ti, both areas belong to volcanic arc and tend to lava plate. A plot of $\text{TiO}_2-10\text{MnO}-\text{P}_2\text{O}_5$ on triangle diagram shows they are in tectonic environment of continent arch and a part of them is in the andesite oceanic islands (OIA). On the diagram of Y versus Cr, and Ce/Sr versus Cr, both areas belong to mixing magmas or transition zone between volcanic arc and oceanic lavaplate. Based on those models, the volcanic lines of Bawean - Muria have their own characteristics that are not mostly within tectonic environment of volcanic arc in the Java Island of Java Arc (islands arc), but they are away from volcanic arc to Back Arc Basin.

The analysis of tectonic, chemical and trace elements by verification of statistical test (t test), resulting $t_{\text{calculating}} \geq t_{\text{table}}$ and $t_{\text{calculating}} \geq t_{\text{table}}$, consequently the hypothesis H_a is accepted with conclusion: there is a difference standards error $\alpha = 0.05$ to 0.10 . The connection between variables of sample is showed by strong connection of correlation coefficient (r) between 0.5 and 0.99 that is identified as a high to very high.

As a conclusion, both areas are in setting lines of PraPaleogene-Paleogene-Neogene tectonic and Back Arc Basin Volcanism. The influences of Paleogene – Neogene tectonics and Neogene volcanic at the study area cause declining the western part to build the Pati Basin and increasing the eastern part as a Bawean – Muria Arc.

Keywords: tectonic and volcanic lines, Pra-Paleogene, Paleogene, Neogene, back arc, Pati Basin, Bawean – Muria Arc.

ABSTRAK

Jalur vulkanik Bawean – Muria berarah barat daya – timur laut, termasuk dalam jalur vulkanik Plistosen-Holosen; terletak di bagian tenggara batas jalur granit Kapur di L. Jawa, dan makin jauh dari subduksi sekarang (*recent subduction*). Hasil interpretasi data seismik pada batuan dasar Pra-Paleogen dan batuan sedimen Paleogen - Neogen, menunjukkan adanya hubungan yang ditandai oleh kesamaan arah azimut ketusan Pra-Paleogen-Paleogen-Neogen. Berdasarkan hubungan tektonik tersebut; membentuk suatu jalur sumber (subcekungan), arah migrasi dan perangkap hidrokarbon di Cekungan Pati.

Bukti lain jalur vulkanik Bawean - Muria adalah komposisi unsur utama, tanah langka dan komposisi mineral menunjukkan jenis/genesa dari magma kalkalkalin - shoshonit. Batuan di G. Muria mempunyai kandungan SiO_2 antara 45 – 60% dan $\text{K}_2\text{O} + \text{Na}_2\text{O}$ antara 6 - 14% termasuk dalam jenis magma basa - menengah; umumnya jenis phonotepit, trakhandesit basal dan phonolit. Di daerah P. Bawean kandungan SiO_2 antara 50 – 60% dan $\text{K}_2\text{O} + \text{Na}_2\text{O}$ antara 7 - 18% juga berada pada magma basa - menengah; umumnya jenis lava phonotepit, tepriphonolit dan phonolit. Hasil plot pada Diagram Harker (SiO_2 vs unsur utama lainnya), AFM dan SiO_2 vs FeO^*/MgO menunjukkan bahwa vulkanik P. Bawean dan G. Muria tersebar mulai dari K sedang-tinggi dan secara umum berada pada jenis magma ultrapotassik dan jenis batuan basal, andesit basal dan andesit.

Hasil analisis pada diagram unsur jejak Zr vs Y; Zr vs Ti; Y vs Cr; Ce/Sr vs Cr; Y vs Nb; (Y+Nb) vs Rb dan diagram laba-laba, kedua daerah tersebut termasuk dalam busur vulkanik dan sedikit condong ke dalam lempeng lava. Hasil plot pada diagram segi tiga TiO_2 - 10MnO - P_2O_5 berada pada lingkungan tektonik busur benua (*continental arc*) dan sebagian berada pada andesit kepulauan samudera (*oceanic islands andesite - OIA*). Pada diagram Y vs Cr dan Ce/Sr vs Cr, kedua daerah tersebut termasuk dalam daerah campuran (*mixing magma*) atau transisi antara busur vulkanik dan lempeng lava samudera. Berdasarkan pemodelan tersebut, jalur vulkanik Bawean – Muria memiliki karakteristik tersendiri yang tidak sepenuhnya berada pada lingkungan tektonik busur vulkanik di P. Jawa, yaitu Busur Jawa atau busur kepulauan (*islands arc*), melainkan menjauh dari busur vulkanik ke arah Cekungan Busur Belakang.

Hasil analisis tektonik, kimia dan unsur jejak diverifikasi melalui uji statistik (*t test*), dan hasilnya $t_{\text{hitung}} \geq t_{\text{tabel}}$ dan $r_{\text{hitung}} \geq r_{\text{tabel}}$, sehingga hipotesis H_0 diterima dengan kesimpulan terdapat perbedaan pada taraf kesalahan $\alpha=0,05-0,10$. Hubungan antar populasi yang diuji ditunjukkan oleh nilai koefisien korelasi/kuatnya hubungan (r) antara 0,5 - 0,99 (tinggi dan sangat tinggi).

Sebagai kesimpulan, kedua daerah tersebut berada dalam jalur tektonik Pra-Paleogen-Paleogen-Neogen dan Vulkanik Cekungan Busur Belakang. Pengaruh tektonik Paleogen-Neogen dan vulkanik Neogen di daerah penelitian tersebut mengakibatkan bagian barat daerah penelitian mengalami penurunan membentuk Cekungan Pati dan bagian timur mengalami pengangkatan membentuk Busur Bawean - Muria.

Kata kunci: jalur tektonik dan vulkanik, Pra-Paleogen, Paleogen, Neogen, busur belakang, Cekungan Pati, Busur Bawean-Muria.