

Geochemical Signatures of Potassic to Sodic Adang Volcanics, Western Sulawesi: Implications for Their Tectonic Setting and Origin

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Abstract	DOI:10.17014/ijog.3.3.195-214The Adang Volcanics represent a series of (ultra) potassic to sodic lavas and tuffaceous rocks of predominantly trachytic composition, which forms the part of a sequence of Late Cenozoic high-K volcanic and associated intrusive rocks occurring extensively throughout Western Sulawesi. The tectonic setting and origin of these high-K rocks have been the subject of considerable debates. The Adang Volcanics have mafic to mafitic-intermediate characteristics (SiO ₂ : 46 - 56 wt%) and a wide range of high alkaline contents (K ₂ O: 0.80 - 9.08 %; Na ₂ O: 0.90 - 7.21 %) with the Total Alkali of 6.67 - 12.60 %. Al ₂ O ₃ values are relatively low (10.63 - 13.21 %) and TiO ₂ values relatively high (1.27 - 1.91 %). Zr and REE concentrations are also relatively high (Zr: 1154 - 2340 ppm; Total REE (TREY = TRE): 899.20 - 1256.50 ppm; TRExOy: 1079.76 - 1507.97 ppm), with an average Zr/TRE ratio of ~ 1.39. The major rock forming minerals are leucite/pseudoleucite, diopside/aegirine, and high temperature phlogopite. Geochemical plots (major oxides and trace elements) using various diagrams suggest the Adang Volcanics formed in a postsubduction, within-plate continental extension/initial rift tectonic setting. It is further suggested magma was generated by minor (< 0.1 %) partial melting of depleted MORB mantle material (garnet-lherzolite) with the silicate melt having undergone strong metasomatism. Melt enrichment is reflected in the alkaline nature of the rocks and geochemical signatures such as Nb/Zr > 0.0627 and (Hf/Sm) _{PM} > 1.23. A comparison with the Vulsini ultrapotassic volcanics from the Roman Province in Italy shows both similarities (spidergram pattern indicating affinity with Group III ultrapotassics volcanics) and differences (nature of mantle metasomatism).
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Author	FADLIN, S.T, M.Eng, D.Sc