

An Experimental Petrological Study at Atmospheric Pressure of the Two-pyroxene Andesite of the Kuanyinshan Area, Northern Taiwan

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ABSTRACT

The two-pyroxene andesite from Kuanyinshan, northern Taiwan, was studied with a high temperature furnace at atmospheric pressure. The purposes of this study were to investigate the crystallization sequence of the phenocrysts, to analyze their chemical compositions and to estimate the evolution trends of the magma.

The two-pyroxene andesite was collected at Shianiuliao. It is grayish, fine to medium grained and with small vesicles. The phenocrysts are plagioclase (up to 1 mm in diameter), augite (up to 5 mm in diameter) and hypersthene. The rock powder was loaded into platinum envelopes and suspended in a 1-atm vertical-quenching furnace. It was quenched into water after the run. The temperature ranged from 1233 °C to 1002 °C, and the duration time was from three hours to ten hours. The run products were made as polished sections. Phases were first identified by a reflected-light microscopy. The compositions of the glasses and phenocrysts were analyzed with an electron microprobe.

The experimental results show that the liquidus temperature is located at 1230 °C, while the solidus temperature is estimated to be close to 1000 °C. The melting interval is about 230 °C. The liquidus minerals are iron-titanian oxide and plagioclase. The following phases are clinopyroxene and orthopyroxene at about 1167 °C. Quartz appears at 1155 °C. At 1114 °C, apatite finally crystallizes. The evolution of the andesitic magma shows the chemical trend as: enrichment in SiO₂ and K₂O; depletion in total FeO and MgO; little variation in the beginning but a decrease in the end for Al₂O₃, CaO and Na₂O; depletion in TiO₂ in the early stages and enrichment in TiO₂ in the later stages. The andesitic magma can produce dacitic and granitic magmas through the fractional crystallization mechanism.

Key words: andesite, Kuanyinshan, fractional crystallization, magma

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