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An Experimental Petrological Study of Gabbro in Chintan, Taipei County, at Atmospheric Pressure

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ABSTRACT

A gabbro from Chintan, Sindian, was subjected to experiments at atmospheric pressure to study the fractional crystallization of the gabbroic melt. The range of experimental temperatures was from 1120 to 1262 C, and the durations were from about 16 to 150 hours. The mineral phases and the glass compositions in the quenching products were analyzed with the SEM-EDS.

The experimental results showed that the liquidus temperature of the gabbro of Chintan is 1261 C. Fe-Ti oxides crystallized at 1261 C. Plagioclase and chromite crystallized at 1233 and 1196 C, respectively. Finally, pyroxene crystallized at 1178 C. The solidus temperature is estimated to be about 1110 C and the melting interval is about 151 C. By comparing the results of the runs with Au_{75}-Pd_{25} capsules, the iron loss of melt to the platinum envelopes at 1238 C over 18 hours can be neglected.

The fractional crystallization of the gabbroic melt at atmospheric pressure is controlled by iron-titanium oxides, plagioclase, chromite, and pyroxene. The differentiation trend of the gabbroic melts moves around in the center of the AFM diagram and can not fractionate into microsyenitic and alkali feldspar syenitic melts on the ground.

Key words: Gabbro, Chintan, Experiment, Melt

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1. INTRODUCTION

Chintan is located in the south of Sindian city, Taipei County, near the boundary of the Taipei basin and the Western foothills of Taiwan. The major rock formations in this area are sedimentary rocks of the Tertiary Period (Fig. 1). Fragmentary volcanic activities occurred in the Neogene Period. The eruption of these volcanics cut across Tertiary sedimentary strata and formed as basaltic rocks in western Taiwan. These igneous rocks often occurred with graben topography (Sun 1982). The rock types of igneous rocks in western Taiwan include alkali basalts and tholeiites, in which alkali basalts can be further categorized as basanitoids, alkali olivine basalts and teschenites (Chen 1990).

Ichimura (1929) first proposed the term "alkali syenites" and reported that the alkali syenites occurred as a dike or sill in the Chintan area (Ichimura 1943; Yen 1954). The dike and sill occurred in the Mushan Formation which was formed in the late Oligocene to the early Miocene Periods. Chen (1998) re-studied the diked and silled igneous rocks which were described by Ichimura (1929, 1943) in Chintan. Chen (1998) found that alkali feldspars are common in Ichimura's alkali syenites. Also, Ti-augite is present while aegirine is absent. Therefore, Chen (1998) proposed microsyenite for the fine-grained texture to replace alkali syenite described by Ichimura (1929, 1943) and Yen (1954).

According to the linear trends in major and trace elements, REE distribution patterns and Sr- and Nd-isotopes, Chen (1998) inferred that the intrusive magma in Chintan underwent in-situ mineral separation when intrusion occurred. After mineral separation, the teschenite crystallized from original magma in the base; the syenite groups represent residual melt. These residual melts segregated alkali feldspar syenite and microsyenite by mineral segregation. There are no teschenites visible in the sill. Chen (1998) pos-

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