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Dendritic titanomagnetite and its magnetic petrologic features of clastogenic lava of Izu-Oshima Volcano, Japan

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Izu-Oshima Volcano is one of the most active volcanoes in Japan. During the last fatal eruption in 1986, basaltic-andesite and andesite lavas were erupted from the fissures opened at and around the summit crater and various types of lava flows were formed from fire fountain. Large amount of clastogenic lava (B Lava) was produced at the peak of the eruption, while continuous coherent lavas were overspilled from the crater, resulting usual aa lava (C Lava). In order to clarify the eruption processes and physical conditions of the 1986 activity and to characterize each type of lavas, we have carried out magnetic petrologic analyses on the lava samples. As a result, we found each lava showed distinct magnetic petrologic characteristics. Rock magnetic results of C Lava were simply explained by different grain size distributions due to different cooling rate of each sample. Difference in grain size was also observed under microscope. Although most completely coalesced lava samples suffered oxyexsolution, produced titanohematite, the other parts of lava contained titanomagnetite only. It was suggested that all lavas were cooled rapidly from high temperatures above 800 degrees C. B Lava had most unusual demagnetization curves of artificial remanences, indicating the intense bimodality of coercivity. Microscopic observation revealed that samples which showed bimodal coercivity distributions contained small dendritic titanomagnetite. Its skeletal shape may cause high coercivity, resulting intense bimodality of coercivity. Dendrite was preserved in lava samples with high cooling rate. Titanomagnetite in the samples with low cooling rate had polyhedral or granular shape. This difference was probably produced at the fountain and the spatter cone, depending on difference of cooling rate and the degree of undercooling. Dendritic magnetic minerals and their distinct magnetic characteristics may be helpful to identifying varying volcanic materials produced from fountain-fed eruption.