# Thellier paleointensity behavior of pillow and subaerial lavas from Korea

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Determination of geomagnetic paleointensity is still problematic. Facing this situation, many kinds of samples including submarine basaltic glass and plagioclase are now utilized in addition to conventional whole rocks. Also new methods, such as modified Shaw or multi-specimen methods other than the classical Thellier method, are recently introduced and applied. However we still do not know what kind of magnetic grains respond to behavior during paleointensity experiments.

In order to compare magnetic behavior of pillow and subaerial basalts during Thellier paleointensity experiments, we collected pillow basalts formed in local aqueous environment and subaerially emplaced basalts comprising massive and vesiculated lavas. Both of the pillow and subaerial lavas originated from a same alkaline magma erupted from Chugaryong Volcano near North and South Korea boundary.

Thellier double-heating paleointensity experiments with partial thermoremanent magnetization (pTRM) checks were performed by using 2.0 or 2.5 mm thick sections from pillow basalts and 1-inch cores from subaerial basalts. Specimens were heated and cooled in Ar atmosphere, and the intensity of applied field to impart pTRM was 50 microT as deduced from the present IGRF intensity.

Pillow basalts showed systematic variations of behavior on Arai diagrams with increasing depth from the glassy surface to the interior. Glass specimens within one centimeter from the surface exhibit linear trends up to 300 deg.C being consistent with the Curie point. From cryptocrystalline to crystalline portions trends become more downward concave even below 200 deg.C, and TRM grows larger in higher temperature making pTRM checks fail. We interpret that multidomain grains become more important with increasing depth from the surface, and also these grains are prone to be altered even in Ar atmosphere.

Massive and vesiculated lavas of subaerial basalts showed different behavior. Specimens from massive lavas have low unblocking temperatures and always exhibit downward convexes on the Arai diagrams reflecting multidomain properties as observed in hysteresis measurements. Vesiculated specimens, which are characterized by Curie point of 580 deg.C and Verwey transition, seem to indicate quasi-linear trends below 400 deg.C but pTRM checks are not satisfied above 400 deg.C. These results suggest that vesiculated lavas contain exsolved magnetite but chemical or crystalline alteration during Thellier experiment makes it difficult to obtain paleointensity.

Pillow basalts can provide reliable Thellier paleointensity values not only from the glass rind but also from the cryptocrystalline portion near the surface. The thickness is only a few centimeters because the magnetic properties rapidly change with increasing distance from the surface. On the other hand, subaerial basalts cannot give any reliable paleointensities. Massive lavas show no linear trends due to multidomain grains, and vesiculated lavas might give higher and lower paleointensities from the lower and higher temperature intervals, respectively. Paleointensities obtained from non-interacting single domain grain assemblages as occurring in pillow lavas should represent ancient geomagnetic field intensities, whereas it seems difficult to obtain reliable paleointensities from other kinds of grain assemblages.