Experimental evaluation of remanence carriers in coercivity-blocking temperature diagram

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Knowledge of the remanence carrier in recording media is crucial for obtaining reliable paleomagnetic data. Here we report newly developed technique to evaluate the remanence carrier of natural rock samples using anhysteretic remanent magnetization (ARM) spectra in coercivity (H_c) and blocking temperature (T_B) plane (hereafter referred to as H_c-$T_B$diagram). Experimental procedures are as follows: (1) imparting ARM at 50 μT DC field and 140 mT AC field, (2) thermal demagnetization (THD) for the ARM at a certain temperature, (3) stepwise alternating field demagnetization (AFD) for the remaining ARM, (4) repeating steps 1–3 with THD treatment at a higher temperature, and (5) calculating second derivative of ARM on the H_c-$T_B$plane. Samples from three basaltic lavas and two welded tuffs were used for H_c-T_B diagram experiments. The basaltic lava samples consist of HW95 from Hawaiian 1995 lava flow of pahoehoe, OS86 from Izu-Oshima 1986 lava flow at the northwest flank of Mihara Volcano (Japan), and UN01 from Kiso-ontake lava flow (called Ueno basaltic rocks) in Nagano (Japan), which extruded during the Matuyama chron. The welded tuff samples were KM01 from Komagatake welded tuff and SK03 from Shikotsu welded tuff, both of which extruded 30-35 ka in Japan. In the cases of HW95, UN01, and KM01 samples, remanence carriers are composed mainly of a single phase in the H_c-$T_B$diagram. The OS86 sample showed two phases in the H_c-$T_B$diagram which can be distinguished from each other by AFD treatment but not THD treatment because of similar $T_B$spectra. In the case of SK03 sample, second derivatives of ARM showed not only positive values but also negative values in the H_c-$T_B$diagram. The negative value implies significant effects of thermal alteration due to laboratory heating. On the basis of H_c -$T_B$diagrams, we will further discuss remanence carriers in the measured samples.

Keywords: Anhysteretic remanent magnetization, Coercivity, Blocking temperature, Paleointensity

