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Field- and current- induced domain wall creep motions in Tb-based ferrimagnetic alloys with varying compositions MICHAEL QUINSAT, SHIHO NAKAMURA, TAKUYA SHIMADA, YASUAKI OOTERA, HIROFUMI MORISE, TSUYOSHI KONDO, Corporate R&D Center, Toshiba Corporation — Due to their tunable magnetization (Ms), Tb-based ferrimagnetic alloys are expected as promising materials for spintronic devices utilizing current-induced domain wall motion (CIDWM) with low current-density. On this material system, we have investigated domain wall motions (DWM) induced by magnetic field H or electric current J in creep regime. We fabricated 2-μm-wide and 9-nm-thick wires made of Tb-based alloys of various composition ratios Tb/CoFe, resulting in Ms of 35-150 emu/cc. From the DW velocities v - H characteristics for the wires, we obtained creep exponents between 1 and 1/4 suggesting strong potential-disorder for DW in the samples[1]. In CIDWM experiments, we also identified creep with J ranging from 5 to 20 MA/cm^2. It is found that the creep driven by J is impeded more seriously by increasing the DW pinning strength observed in the creep by H, while the J-induced DW motion is in the electrons' flow. We infer that the observed DW motion by J for the present samples is interfered with the potential disorders, unlike to the case of Co/Ni wires in a literature[2]. [1] A.B. Kolton et al., Phys. Rev. Lett. 94, 047002 (2005). [2] T. Koyama et al., Nature Materials 10, 194 (2011).

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