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Magneto-transport and spin-torque effects in current perpendicular to the plane spin-valves with Co-Fe-Al magnetic layers STEFAN MAAT, MATTHEW CAREY, JEFFREY CHILDRESS — The magneto-transport of current-perpendicular to the plane giant magneto-resistive spin valves utilizing $(Co_xFe_{100-x})_{100-y}Al_y$ alloys in the reference and free layers is investigated. $(Co_{50}Fe_{50})_{75}Al_{25}$ is determined to be the alloy composition that maximizes magneto-resistance. At this composition the magnetization is around 1000 emu/cm^3, which is high enough to be used as magnetic material in spin-valves with ultra-thin read gaps for high recording densities. An improvement in magneto-resistance from 1.7% for spin-valves utilizing $Co_{50}Fe_{50}$ in reference and free layers to 3.3% for spin-valves utilizing $(Co_{50}Fe_{50})_{75}Al_{25}$ with the same "magnetic" thickness in both parts of the reference and the free layers were observed. The spin-diffusion length for $(Co_{50}Fe_{50})_{75}Al_{25}$ is determined to be approximately 30 Å. Spin-torque measurements show that the spin-torque current density threshold is approximately $7{\cdot}10^7$ A/cm^2 in CoFeAl spin-valves in comparison to $13{\cdot}10^7$ A/cm^2 in CoFe spin-valves.

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