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Magneto-transport properties of CVD grown MoS2 lateral spin valves

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We have investigated magneto-transport properties in a MoS2 lateral spin-valve structures for different ferromagnetic CoFe electrode shapes and MoS2 channel lengths. For these devices, high quality and large-scale MoS2 thin films were synthesized through sulfurization of epitaxial MoO3 films and these sulfurized-MoO3 thin films properties are in good agreements with measurements on exfoliated MoS2 film. Magneto-transport measurements show a clear rectangular magnetoresistance signal of 0.16% and a spin polarization of 0.00012%. By using the one-dimensional spin diffusion equation, we extracted the spin diffusion length and coefficient, finding them to be 12 nm and 1.44×10^{-3} cm²/s, respectively. These small values of magnetoresistance and spin polarization could be enhanced by appeasement of conductivity mismatch between the ferromagnet and semiconductor interface.

Keywords: MoS2, Spin Valve

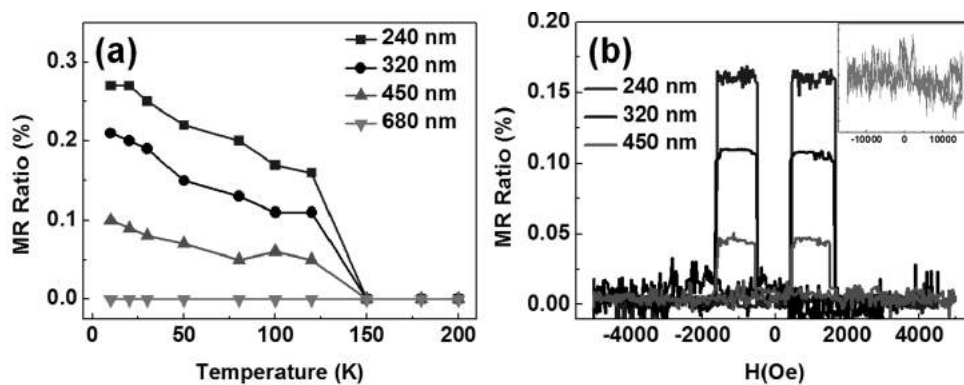


Figure 1. (a) Temperature dependence of the MR ratio as a function of the MoS2 channel lengths and (b) Magneto-transport curves measured at 120 K for MoS2 lateral SVs with 240, 320, 450 nm of channel lengths as the sweep field from an in-plane along easy axis configuration. Figure 4 inset shows magneto-transport curve for MoS2 lateral SVs with 680 nm of channel length.