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Measurements of GMR and Spin Valve Effects in Single Co/Cu/Co Nanowires[1] MINGLIANG TIAN, The Pennsylvania State University, JIAN WANG, JOE KULIK, JEREMY CARDELLINO, DAVID RENCH, THOMAS MALLOUK, MOSES CHAN, NITIN SAMARTH — The fabrication of metallic multilayer nanowires (NWs) by electrodeposition has allowed studies of spin transport in a variety of NW systems in recent years. Here, we study the transition from giant magnetoresistance (GMR) to spin valve behavior in single crystal Co/Cu/Co multilayer NWs by systematically varying the NW architecture. The NWs are fabricated by electrodeposition in polycarbonate membranes and characterized using transmission electron microscopy and magnetic force microscopy. We carry out four-probe measurements of the magnetoresistance of single NW devices over the temperature range 4.2 K $<$ T $<$ 300 K. When the Cu spacer thickness t_{Cu} is smaller than 100 nm, we observe GMR with room temperature values as high as $\sim$10 %. In this regime, the reduction of the GMR with increasing spacer thickness is qualitatively similar to that observed in past studies of thin film multilayers. When t_{Cu} approaches 170 nm, we observe a transition to spin valve behavior, suggesting a reduction of the interlayer coupling. Finally, for t_{Cu} $>$ 200 nm, the NWs display only anisotropic magnetoresistance.

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