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Chirality-induced Spin Selectivity in Molecular Spin Valves: Role of the Nonmagnetic Electrode[1] YUWARAJ ADHIKARI, TIANHAN LIU, Department of Physics, Florida State University, HAILONG WANG, Institute of Semiconductors, Chinese academy of Sciences, ZHENQI HWA, HAOYANG LIU, ERIC LOCHNER, Department of Physics, Florida State University, JIANHUA ZHAO, Institute of Semiconductors, Chinese academy of Sciences, PENG XIONG, Department of Physics, Florida State University, ZHAO GROUP COLLABORATION — Chirality-induced spin selectivity (CISS), an effect in which structural chirality engenders spin polarization in the electrical current from a nonmagnetic metal (NM) electrode, has been observed in a variety of chiral molecules with various experimental probes. However, the microscopic origin and device manifestations of CISS remain controversial. Most theoretical models consider chiral molecules as a spin filter, despite the generally small spin orbit coupling (SOC) in organic molecules. A recent theory posits that chiral molecules act as an orbital polarizer, and the SOC in nonmagnetic electrode converts the orbital polarization to spin polarization. Here, we report a comparison of CISS-induced magnetoconductance (MC) in vertical heterojunctions of (Ga,Mn)As/AHPA-L molecules/NM, between NM of Au and Al. The perpendicularly magnetized (Ga,Mn)As functions as a spin analyzer. The Au junctions show pronounced MC signals, which contain a large nonlinear-response component and a nontrivial-linear response component. In contrast, the MC of Al junctions are significantly diminished. Our observations suggest an important role for SOC in NM electrode in CISS-induced spin valve effect.

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Yuwaraj Adhikari
Florida State University

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