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Ferroelectrically controlled organic spin valves with tunable magnetoresistance MEI FANG, Fudan Unviersity, DALI SUN, XIAOSHAN XU, LU JIANG, HANGWEN GUO, HO NYUNG LEE, PAUL C. SNIJDERS, T.Z. WARD, ZHENG GAI, X.-G ZHANG, Oak Ridge National Laboratory, JIAN SHEN, LIFENG YIN, YANMEI WANG, WENTING YANG, Fudan Unviersity, FUDAN UNIVERSITY TEAM, OAK RIDGE NATIONAL LABORATORY COLLABORATION — Organic spin valves (OSV) with tunable magnetoresistance (MR) will promote organic spintronics for many potential applications. In this work, a novel ferroelectrically (FE) controlled organic spin valve (FE-OSV) was successfully fabricated by inserting a thin $PbZr_{0.2}Ti_{0.8}O_3$(PZT) buffer layer between the ferromagnetic bottom $La_{0.67}Sr_{0.33}MnO_3$(LSMO) electrode and the organic Alq_3 layer. The magnitude of MR values in these FE-OSV strongly depends on the history of the bias voltage applied, giving rise to a strong hysteretic behavior of MR vs. V. Moreover, the sign of MR in the FE-OSV can be electrically switched when the electric polarization of PZT layer is reversed. Both behaviors are not observed in the devices without the FE layer. These new findings are attributed to the tunability of the electric dipole moment of the PZT layer, which can actively shift the relative energy level between Alq_3 and LSMO and thence alter the spin injection.

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