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Conjugated molecules as amplifiers of anisotropic magneto-resistance in molecular junctions DAVID RAKHMILEVITCH, SOUMYAJIT SARKAR, ORA BITTON, LEEOR KRONIK, OREN TAL, Weizmann Institute of Science — The simplest way to manipulate spin transport at the atomic scale is based on the anisotropic magneto-resistance (AMR) effect which refers to the dependence of current through a ferromagnetic element on the direction of its magnetization. However the resulting change in resistance is limited to 15%, making AMR an unlikely candidate for spintronic applications. In this respect, molecules adsorbed on ferromagnetic surfaces, were shown to modify local spin properties and therefore may facilitate in enhancing AMR effect at the atomic scale. Here we demonstrate a 210% AMR in a single molecule junction based on a benzene molecule suspended between two nickel (Ni) electrodes. These results are in strike contrast with the AMR for bulk Ni (2%) or atomic Ni junctions (10%) measured on our devices. In addition, we take advantage of the electro-mechanical sensitivity of molecular junctions to show the measured AMR can be effectively tuned by elongating the junction. These results are explained by ab-initio calculations in the context of selective orbital hybridization. Our findings pave the way for simple and highly-effective control of spin transport at the atomic scale, promoting the feasibility of single-molecule spintronics.

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