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Tailoring intermolecular and interfacial interactions in organic spin valves via selective deuteration of polyfluorene chains[1] ALEXANDRA STEFFEN, NURADHIKA HERATH, JONG KEUM, HONHAI ZHANG, KULUN HONG, JACEK JAKOWSKI, JINGSONG HUANG, JIM BROWNING, STEVEN BENNETT, KAI XIAO, CHRISTOPHER ROULEAU, ILIA IVANOV, VALERIA LAUTER, Oak Ridge National Laboratory — Organic spin valves (OSV) are in the focus of development of low power spintronic devices. Because of the very week spin-orbit coupling, the spin polarization of the carriers in organic semiconductors can be maintained for a very long time. The spin diffusion length is critical to the coherent transport of spins inside spintronics devices. Deuteration changes the spin diffusion length, but the underlying mechanisms are neither systematically investigated nor fully understood. Here we reveal the influence of different type polymers on the interfacial interactions and magnetization via Polarized Neutron Reflectometry, VSM and transport measurements. The investigated spin valve system is based on the tri-layer of LSMO/Polymer/Co, where PFO is selected as an n-type semiconductor and P3HT as p-type one. The combined effort of theoretical prescreening, distinct syntheses and deuteration of four PFO isotopes, and optimization of each individual component of the OSV fabrication allowed us to explore the influence of the PFO and P3HT with deuterium substitution of different chain parts on the magnetic structure of the spin valves.

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