Abstract Submitted
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Magnetic Field Control of Current through Molecular Ring Junctions[1] DHURBA RAI, MICHAEL GALPERIN, Department of Chemistry and Biochemistry, University of California, San Diego, USA, ODED HOD, ABRAHAM NITZAN, School of Chemistry, Tel Aviv University, Ramat Aviv, Israel — We study circular currents driven by voltage bias in molecular wires with ring structures [J. Phys. Chem. C 114, 20583 (2010)]. We revisit magnetic field effects on molecular ring structures presenting conditions under which magnetic field control of molecular ring conduction is realizable. [Phys. Rev. B 85, 155440 (2012)]. We find these conditions to be (a) weak molecule-lead coupling, implying relatively distinct conduction resonances, (b) asymmetric junction structure (e.g., meta or ortho connected benzene ring rather than a para connection), and (c) minimal dephasing (implying low temperature) so as to maintain coherence between multiple pathways of conduction. When these conditions are satisfied, considerable sensitivity to the applied magnetic field normal to the molecular ring plane is found. Although sensitivity to magnetic field is suppressed by dephasing, quantitative estimates indicate that magnetic field control can be observed in suitably constructed molecular ring junctions. We demonstrate control of the spin-flip inelastic electron tunnelling spectroscopy (IETS) signal and discuss spin polarization of total and circular currents in a benzene ring junction with spin impurity [Phys. Rev. B 86, 045420 (2012)].

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