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Conductance of Conjugated Organic Compounds in Controlled Environments[1]

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We use the mechanical and the electromigration break junction technique, as well as nanoparticle arrays, to measure the electrical conductance of a range of conjugated organic molecules with different end functionalities at room temperature in a liquid cell. We first report on a comparison between oligo(phenylene vinylene) (OPV) oligo(phenylene ethynylene) (OPE). We find that OPV conducts slightly better than OPE. Solubilizing side groups do not prevent the molecules from being anchored within a break junction. With the aim to realize a functional switch, we show preliminary electrical conductance studies of a newly synthesized cruciform molecule. Using the nanoparticle platform we further demon-strate light and electrochemical-induced conductance switching of photochromic and redox molecules. We further discuss OPV and OPE molecules with different end groups, including asymmetric ones. To our surprise, molecules having an anchor group only on one side also gave rise to a pronounced mo-lecular signal. We attribute this effect to the interaction between neighboring molecules in the junction likely induced by π-π stacking. This remarkable property highlights the importance of intermolecu-lar interaction in molecular junctions, an often overlooked aspect. If time permits, a recent study on low-frequency fluctuations in molecular junctions will be mentioned as well. Collaborators are (alphabetic order): J. Agustsson, J. Brunner, M. Calame, T. Gonzalez, S. Grunder, V. Horhoiu, R. Huber, J. Liao, M. Mayor, M. Mangold, S. Oberholzer, M. Steinacher, S. Wu, Z.M. Wu, (all at the Swiss Nanoscience Institute at the Univ. of Basel) and M. R. Bryce (Durham University, UK).

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