Abstract Submitted
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Turning a Single Molecule into an Electric Motor CHARLES SYKES, Tufts University — Significant progress has been made in the construction of molecular motors powered by light and by chemical reactions, but electrically-driven motors have only just been demonstrated [1,2] after many theoretical proposals. Studying the rotation of molecules bound to surfaces offers the advantage that a single layer can be assembled, monitored and manipulated using the tools of surface science. Thioether molecules constitute a simple, robust system with which to study molecular rotation as a function of temperature, electron energy, applied fields, and proximity of neighboring molecules. A butyl methyl sulphide (BuSMe) molecule adsorbed on a copper surface can be operated as a single-molecule electric motor. Electrons from a scanning tunneling microscope are used to drive directional motion of the BuSMe molecule in a two terminal setup. Moreover, the temperature and electron flux can be adjusted to allow each rotational event to be monitored at the molecular-scale in real time. The direction and rate of the rotation are related to the chiralities of the molecule and the tip of the microscope (which serves as the electrode), which illustrates the importance of the symmetry of the metal contacts in atomic-scale electrical devices. [1] Experimental Demonstration of a Single-Molecule Electric Motor H. L. Tierney, C. J. Murphy, A. D. Jewell, A. E. Baber, E. V. Iski, H. Y. Khodaverdian, A. F. McGuire, Nikolai Klebanov and E. C. H. Sykes - Nature Nanotechnology 2011, 6, 625-629 [2] Electrically driven directional motion of a four-wheeled molecule on a metal surface Kudernac, T., Ruangsupapichat, N., Parschau, M., Macia, B., Katsonis, N., Harutyunyan, S. R., Ernst, K.-H., Feringa, B. L. - Nature 2011, 479, 208–211

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