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Reversible Photomechanical Switching of Individual Engineered Molecules at a Surface MATTHEW COMSTOCK, NIV LEVY, ARMEN KIRAKOSIAN, JONGWEON CHO, FRANK LAUTERWASSER, JESSICA HARVEY, DAVID STRUBBE, JEAN FRÉCHET, DIRK TRAUNER, STEVEN LOUIE, MICHAEL CROMMIE, University of California at Berkeley — We have spatially resolved reversible light-induced mechanical switching in a single organic molecule bound to a metal surface. Scanning tunneling microscopy (STM) was used to image the features of an individual azobenzene molecule on a gold surface before and after reversibly cycling its mechanical structure between *trans* and *cis* states via photo-actuation (i.e., photoisomerization). Azobenzene molecules were engineered to increase their surface photomechanical activity by attaching varying numbers of *tert*-butyl (TB) ligands ("legs") to the azobenzene phenyl rings. We find that azobenzene molecules lacking TB legs or having only two legs do not switch on a gold substrate under UV irradiation, while molecules synthesized with four TB legs can be photoswitched on gold. STM images of the functionalized molecules show that increasing the number of TB legs "lifts" the azobenzene molecules from the substrate, thereby increasing their photomechanical activity. The reversibility of the photoreaction, along with comparison of experimental data to *ab initio* simulation of isomerized azobenzene, confirms the photo-induced *trans-cis* conversion of single molecules.

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