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Single Molecule Conductance Measurement of Photochromic Molecules and Carotenoids JIN HE, FAN CHEN, JUN LI, OTTO SANKEY, Department of Physics and Astronomy, YUICHI TERAZONO, PAUL LIDDELL, JOAKIM ANDREASSON, STEPHEN STRAIGHT, DEVEN GUST, THOMAS MOORE, ANA MOORE, Department of Chemistry and Biochemistry, STUART LINDSAY, Department of Physics and Astronomy, Department of Chemistry and Biochemistry, The Biodesign Institute, Arizona State University — We report data for the single molecule conductance of (a) photochromic molecules in the 'open' and 'closed' forms and (b) carotenoid polyenes. The photochromic molecules we studied switch between an open state (that absorbs in the UV to become closed) and a closed state (that absorbs in the visible to become open) through light-induced isomerization. The molecular resistance is 526±90 MΩ in the open form and 4±1 MΩ in the closed form when attached to gold break junction electrodes via thiol linkages. Carotenoid polyenes play an essential role as 'molecular wires' in photosynthesis. We measured the electrical conductance of a series of carotenoids with 5, 7, 9 and 11 double-single bond pairs. The electronic decay constant, β, is determined to be $0.224 \pm 0.036 \text{Å}^{-1}$ in close agreement with the value obtained from first principles simulations (0.217 ± 0.01 Å^{-1}). The absolute values of the molecular conductance are within a factor three of those calculated from first-principles.

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