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Stereoelectronic Switching in Single-Molecule Junctions[1] HAIXING LI, Department of Applied Physics and Applied Maths, Columbia University, TIMOTHY SU, MICHAEL STEIGERWALD, COLIN NUCKOLLS, Department of Chemistry, Columbia University, LATHA VENKATARAMAN, Department of Applied Physics and Applied Maths, Columbia University — We demonstrate the first single-molecule switch that operates through a stereoelectronic effect in silicon-based molecular backbones terminated with methyl-sulfide linker groups. We utilize the subangstrom level of control in a scanning tunneling microscope-based break-junction (STM-BJ) technique to manipulate the conformation of these single-molecule junctions formed with silanes. We show that we can increase conductance by elongating the molecular junction and decrease conductance by compressing the junction. The switching that we see is binary and is faster than the microsecond time resolution of the STM. Theoretical calculations support the existence of molecular junction conformations that differ in their electronic character, and provide evidence that the strong conjugation in these silicon chains, comparable to that of conjugated carbon chains, enables this stereoelectronic switching.

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