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Molecular electronics: the single-molecule switch and transistor KAI SOTTHEWES, University of Twente, VICTOR GESKIN, University of Mons, RENE HEIMBUCH, AVIJIT KUMAR, HAROLD ZANDVLIET, University of Twente — In order to design and realize single-molecule devices it is essential to have a good understanding of the properties of an individual molecule. For electronic applications, the most important property of a molecule is its conductance. Here we show how a single octanethiol molecule can be connected to macroscopic leads and how the transport properties of the molecule can be measured. Based on this knowledge, we have realized two single-molecule devices: a molecular switch and a molecular transistor. The switch can be opened and closed at will by carefully adjusting the separation between the electrical contacts and the voltage drop across the contacts. This single-molecular switch operates in a broad temperature range from cryogenic temperatures all the way up to room temperature. Via mechanical gating, i.e. compressing or stretching of the octanethiol molecule, by varying the contact's interspace, we are able to systematically adjust the conductance of the electrode-octanethiol-electrode junction. This two-terminal single-molecule transistor is very robust, but the amplification factor is rather limited.

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