

Research Highlights

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Molecular electronics: Junction crossing

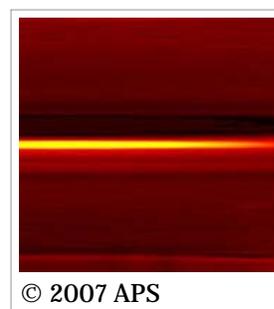
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Electron transport through a C₆₀ molecule can be tuned mechanically when the molecule is suspended in a break junction between two nanowires

The interaction between mobile electrons and a fixed spin — known as the Kondo effect — was first studied in metals containing magnetic impurities. With advances in lithography and miniaturized electronics, the same effect can now be explored with high precision in a single 'artificial' impurity, such as a quantum dot or carbon nanotube, contacted to metal wires.

Joshua Parks, Dan Ralph and colleagues¹ (#B1) at Cornell University in the US have now devised a way to mechanically tune the interaction between the spin and conduction electrons in a molecular circuit. They form a molecular scale break in a long gold nanowire, approximately 30 nm thick and suspended about 40 nm above a silicon wafer. The junction is just wide enough to sandwich a single C₆₀ molecule. Because C₆₀ is electronegative with respect to gold, an unpaired electron (and hence, an unpaired spin) tends to sit on the molecule.

Bending the underlying wafer allows the Cornell group to stretch the junction while monitoring the current of electrons through the C₆₀ molecule. Increasing the width of the junction by less than a tenth of a nanometre affects the Kondo interaction significantly, and effects of vibrations in the C₆₀ molecule can even be observed.



REFERENCES

1. Parks, J. J. *et al.* Tuning the Kondo effect with a mechanically controllable break junction. *Phys. Rev. Lett.* **99**, 026601 (2007). | [Article \(http://dx.doi.org/10.1103/PhysRevLett.99.026601\)](http://dx.doi.org/10.1103/PhysRevLett.99.026601) |