Researchers build a single-molecule diode

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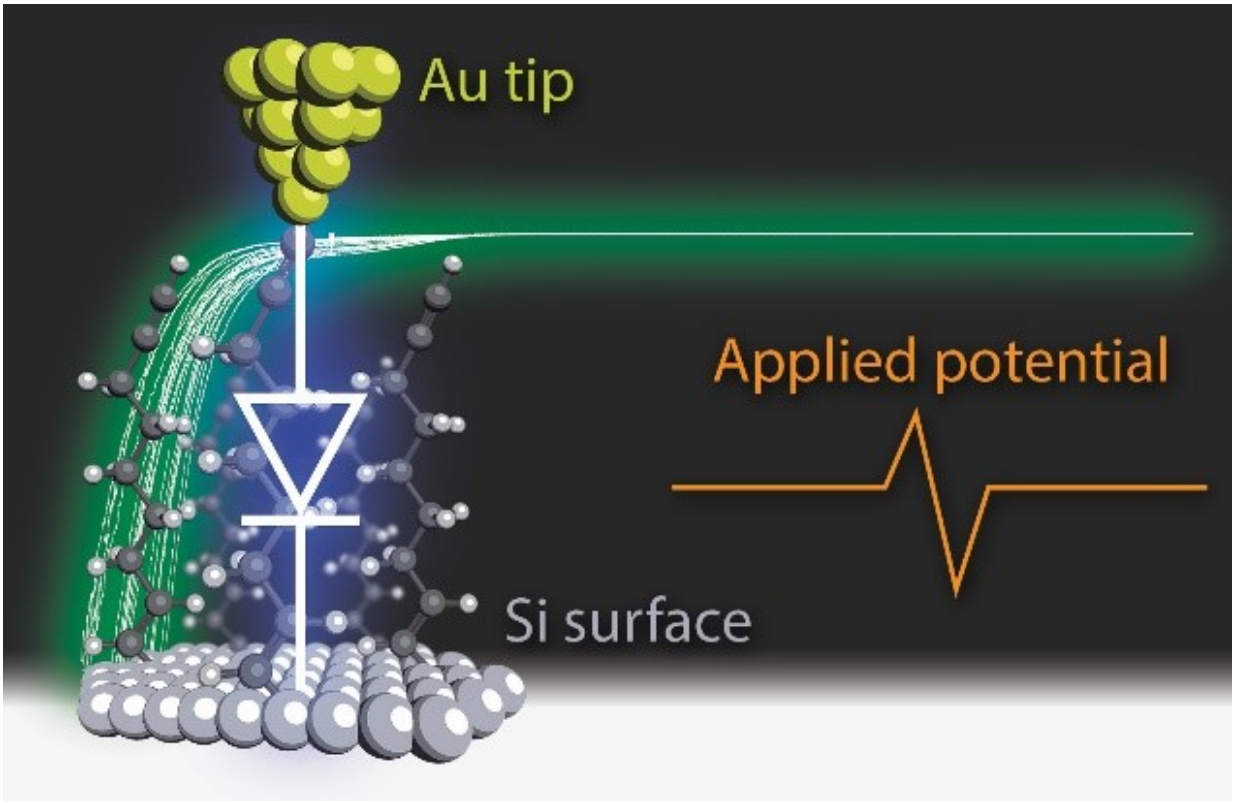

Single-molecule diode formed by sandwiching a molecule between a gold and a silicon electrode. Credit: I Díez-Pérez

Researchers of the University of Barcelona have led a project to create a diode out of a 1 nm-sized single molecule with high rectification ratios. Diodes, commonly used in in everyday electronic devices, allow current to flow in one direction while blocking the current in the opposite

direction.

Today, researchers are approaching the physical limit in downsizing electronic components. According to Ismael Díez Pérez, who is leading the project at the University of Barcelona and is also member of the Institute of Bioengineering of Catalonia (IBEC), "In order to go to the next level of miniaturization, we have to use individual molecules as the active components of the circuits". This study, recently published in the journal *Nature Communications*, has used an organic molecule sandwiched between two nano-electrodes connected altogether in a circuit that is barely 1 nm long. The resulting single-molecule diode is smaller and much more efficient than any other reported. "This approach favours the assembly of thousands of billions of diodes on a tiny silicon chip", affirms Díez-Pérez.

The reported molecular diode can allow current to go in one direction 4.000 times more than in the opposite direction. This efficiency is comparable to the diodes that are currently used, which are much bigger.

The team is now working on achieving higher current rectification ratios and increasing the lifetime of these single-molecule circuits. This research brings us a step closer to the realisation of single-molecule devices.

More information: Albert C. Aragonès et al. Single-molecule electrical contacts on silicon electrodes under ambient conditions, *Nature Communications* (2017). DOI: 10.1038/NCOMMS15056

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