TWO-DIMENSIONAL MATERIALS

Single molecules bridge the gap

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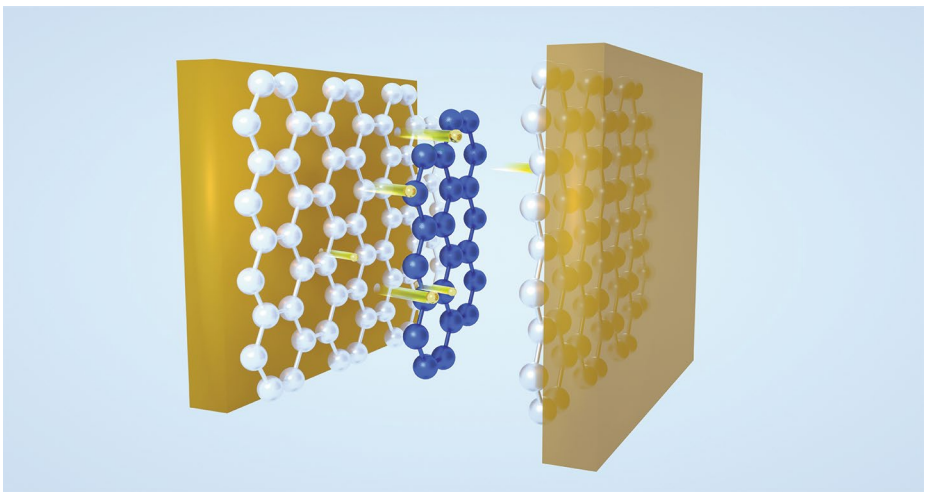

Credit: AAAS

Layers of different two-dimensional materials can be stacked in combination to form van der Waals heterostructures. This stacking can be achieved through mechanical exfoliation of the individual layers or by growing the layers sequentially one atop the other, but both approaches come with their own particular challenges. Now, Yang Yang, Colin Lamb, Wenjing Hong and colleagues have used techniques previously developed for molecular electronics to fabricate van der Waals heterojunctions that consist of an atomically thin layer of organic molecules sandwiched between two graphene layers.

The researchers — who are based at Xiamen University and Lancaster University — placed two graphene-coated contacts into a solution containing the target molecule (an aromatic hydrocarbon). The gap between the two contacts was then repeatedly opened and closed, by slightly deforming the structure with a piezoelectric actuator, while the cross-plane current (the current perpendicular to the layers) was measured and fed back to the actuator. With the approach, they show that a single molecular layer can tune the electric charge transport across the junction, which can be varied greatly by the choice of sandwich molecule.

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