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Electronic transport properties of tailored two dimensional materials for chemical sensors

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Nanoscale sensors are widely used in industrial, environmental, and healthcare applications. The performance of chemical sensors depends on the host materials properties; low dimensional materials, e.g. graphene or carbon nanotubes, can be used as host materials to detect chemicals in the environment. These materials provide wide surface area per unit of volume capable of hosting concentrations of impurities, and they exhibit conductivity that is sensitive to chemical perturbations. In this work, we obtain the electronic transport properties of low dimensional materials to improve sensitivity and selectivity features of nanoscale chemical sensors. Volatile organic compounds, in the vicinity of the host, can cause alterations in their electronic properties. These alterations, such as variances in the energy-dependent conductance, can be investigated and categorized for each chemical component. We aim at solving the inverse-problem in which the hitherto unknown chemical impurities and their concentrations are determined by analyzing the conductance variance they impart onto the host. Our goal is to quantify the conductance fingerprint that some organic compounds induce on the host and to propose ways of improving the device sensitivity based on these findings.

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