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Electron and heat transport in graphene-based single-molecule devices JAN MOL, PASCAL GEHRING, CHIT LAU, ANDREW BRIGGS, University of Oxford — Graphene nano-electrodes provide a versatile platform for contacting individual molecules. Unlike metal electrodes, graphene is atomically stable at room temperature and screening of the gate electric field is strongly reduced by the two-dimensional nature of the electrodes. Molecules can be anchored to the graphene via π-π stacking bonds. We will present single electron transport measurements of single pyrene-functionalised C60 molecules. Strong electron-phonon coupling in these molecules leads to the observation of Franck-Condon blockade. In addition to spectroscopic transport features arising from the electronic and mechanical degrees of freedom of the fullerene molecule, we observe the effect of quantum interference in the graphene leads. Density-of-states fluctuations due to multi-mode Fabry-Perot interference in graphene result in energy dependent coupling between the graphene leads and the molecule. Finally, we will present thermoelectric measurements of our graphene-based nanostructures, and show the energy dependent Seebeck coefficient both in the sequential electron tunnelling and quantum interference regime. Our experiments demonstrate the capability of graphene-based molecular junctions for studying transport in single molecules, and highlight spectroscopic features that cannot readily be observed in metal-molecule junctions.

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