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Title: Carrier mobility and scattering lifetime in electric double-layer gated few-layer graphene

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Highlights

- Few-layer graphene FETs have been fabricated by mechanical exfoliation, photolithography, metal evaporation and lift-off.
- A Li-TFSI based polymer electrolyte solution (PES) has been employed to induce carrier densities as high as $\approx 6 \times 10^{14} \text{ e}^-/\text{cm}^2$ in the device's channel.
- The dependences of the sheet conductance and the mobility on the carrier density have been explored both at room temperature and below the PES glass transition.
- A strong asymmetry in these quantities has been found between electron and hole doping.
- A combination of experimental results and ab-initio DFT calculations has been used to obtain the average scattering lifetime of the charge carriers.
- Two competing effects are found to determine the scattering lifetime: the increase in the carrier density and an unexpected increase in the density of surface charged scattering centers.

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