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Conductivity noise as a transport-based probe to study the charge-carrier transmission across grain boundaries in polycrystalline graphene VIDYA KOCHAT, Dept. of Physics, IISc, India, CHANDRA SEKHAR TIWARY, Dept. of Materials Engineering, IISc, India, TATHAGATA BISWAS, Dept. of Physics, IISc, India, GOPALAKRISHNAN RAMALINGAM, Materials Research Centre, IISc, India, SRINIVASAN RAGHAVAN, Materials Research Centre, Centre for Nano Science and Engineering, IISc, India, KAMANIO CHATTOPADHYAY, Dept. of Materials Engineering, IISc, India, MANISH JAIN, ARINDAM GHOSH, Dept. of Physics, IISc, India — Grain boundaries (GBs) form a class of topological defects, intrinsically present in polycrystalline graphene films and inevitably affect the electronic properties of the otherwise perfect honeycomb lattice. In this work, we have studied the charge carrier transmission across individual GBs in graphene having varying levels of disorder. We find that the defect density in the interface region of two adjoining graphene grains is directly related to their misorientation angle. Conductivity noise (low frequency 1/f noise) is a more sensitive probe to identify the microscopic mechanism of carrier scattering and can quantify the disorder levels of various types of GBs. The 1/f noise across wider interfaces were found to be higher by an order of magnitude when compared to the single-crystalline graphene regions, indicating huge amount of dynamic scattering processes at the interface region. We also obtain evidence for enhanced spin-flip scattering at the GBs from the measured conductivity noise at low temperatures suggestive of the fact that the GBs in graphene could sustain local magnetic moments.

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