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Topological Aspects of Charge-Carrier Transmission across Grain Boundaries in Graphene[1] OLEG V. YAZYEV, FERNANDO GARGIULO, Ecole Polytechnique Federale de Lausanne (EPFL), Switzerland — Dislocations and grain boundaries are intrinsic topological defects of large-scale polycrystalline samples of graphene. These structural irregularities have been shown to strongly affect electronic transport in this material. Here, we report a systematic investigation of the transmission of charge carriers across the grain-boundary defects in polycrystalline graphene by means of the Landauer-Büttiker formalism within the tight-binding approximation. Calculations reveal a strong suppression of transmission at low energies upon decreasing the density of dislocations with the smallest Burgers vector $\mathbf{b} = (1, 0)$. The observed transport anomaly is explained from the point of view of resonant back-scattering due to localized states of topological origin. These states are related to the gauge field associated with all dislocations characterized by $\mathbf{b} = (n, m)$ with $n - m \neq 3q$ ($q \in Z$). Our work identifies an important source of charge-carrier scattering caused by the topological defects present in large-area graphene samples produced by chemical vapor deposition.

Reference: F. Gargiulo and O. V. Yazyev, arXiv:1307.6746.

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