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Charge Transfer Properties Through Graphene for Applications in Gaseous Detectors

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Graphene is a single layer of carbon atoms arranged in a honeycomb lattice with remarkable mechanical, electrical and optical properties. It can be regarded as the thinnest and narrowest conductive mesh with a strong asymmetry for the transmission of low energetic electrons and ions.
Graphene layers with an area of the order of a few cm^2 were transferred onto metal support structures with holes of diameters from 30 um to 70 um and pitches of the order of twice the hole diameter, so that the graphene layers were freely suspended in the holes.
The samples were installed into a gaseous detector equipped with a triple Gas Electron Multiplier (GEM), and the transparency of the graphene to electrons and ions was studied in gas as a function of the electric fields applied.
We describe the transfer techniques of the graphene layers from the substrate to the experimental setup as well as the procedures to measure the charge transfer properties. Results will be presented with special attention to the challenges arising from defects in the graphene layers. We furthermore describe solutions to study the intrinsic transmission properties of this material and discuss applications where these techniques can be used to improve the state of the art of gaseous detectors.

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