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pi-pi Functionalization of Graphene: Avenue for building Ultrasensitive Graphene BioSensors KABEER JASUJA, JOSHUA LINN, VIKAS BERRY, Kansas State University — The tremendous attention received by graphene has been attributed to its sp^2 hybridized carbon atoms arranged in a 2-D honeycomb lattice structure with a high density of π electrons confined within the quasi-planar, atomically-thick sheet. These structural and electronic attributes impart graphene with remarkable electrical, mechanical, and optical properties. Currently, covalent functionalization of graphene is carried out starting from graphene oxide (GO). This process deteriorates graphene's superior electrical properties by (i) opening up a band gap via removal of pi-electrons and (ii) increasing carrier scattering due to (a) the distorted structure produced by conversion of planar sp^2 to tetrahedral sp^3 carbons, (b) the charged impurities introduced and (c) the vacancy defects formed via removed carbon atoms. There is an immediate need for a functionalization mechanism, which retains the sp^2 carbons and the low scattering density on graphene's lattice structure. Here we present the electrical and interfacial characterization of graphene functionalized via pi-pi bonding mechanism that produces a minimal change in carrier density and scattering (10^4 fold reduced carrier scattering). We will present the functionalization and characterization of several biomolecular groups on graphene and show the bio-detection properties.

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