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η^6 Chemical Modification of Epitaxial Graphene: An Avenue for Non Destructive Surface Functionalization and Atomic Layer Deposition

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— Graphene's superior properties are expected to develop next generation electronic applications. However, a major challenge which still remains is to incorporate it into different systems via its functionalization. Moreover, such functionalization must not alter graphene's superior properties. In most cases, functionalization leads to conversion of the planar sp^2 hybridized state of carbon into the tetrahedral sp^3 states. This conversion leads to an increase in carrier-scattering and a reduction in carrier-density. In this talk, we demonstrate a novel η^6 functionalization route, where the d-orbital of a transition metal binds with the pi-cloud at the center of graphene's aromatic rings resulting in a unique grafting of a monolayer of metal atoms. As a result, the sp^2 state of the carbon atoms is preserved and its superior properties (high carrier density and low carrier scattering) are maintained. We envision that this functionalization route will allow graphene to be interfaced with several systems, thus significantly broadening the scope of its applications.

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