Photonic properties of graphene-based supramolecular self-assembled architectures

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Graphene is a zero band-gap semiconductor, which confers to it many remarkable and potentially exploitable optoelectronic properties. The modulation of these properties, which can be obtained by molecular functionalization, is an important current issue for such applications. We have recently developed original molecular-engineering concepts for designing molecular building blocks spontaneously adsorbing on graphene according to various preprogrammed patterns.[1] We have realized and probed the photonic responses of several self-assembled structures grown onto graphene. The STM images permit an accurate structural analysis of molecular organization induced by the atomic-scale template of graphene.

The organized self-assembly has a clear influence on optical properties, as observed by transmission and fluorescence spectroscopy.[2] We also report the first fluorescent molecular self-assembly on graphene.[3] The inherent quenching of dye’s excited-state by the adjacent graphene is hindered at the molecular scale based on a spacer approach, through specifically designed dual-functionalized self-assembling building blocks.