Semiconductor-Metal Nanoparticles Anchored on Graphene Oxide: Photocatalysis and SERS Detection

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Our recent efforts have focused on utilizing graphene based assemblies for light energy conversion, energy storage and sensing applications [1-4]. Electrophoretic deposition method has been employed to anchor single-layered GO onto to TiO_2 NP films. Under UV irradiation photogenerated electrons are transferred across graphene sheet. These electrons are capable of reducing Ag+ ions from solution and deposit Ag nanoparticles on the GO surface. By controlling the irradiation time we can tune the size and loading of metal nanoparticles.

The semiconductor-graphene-metal nanoparticle (SGM) films can be used as a photocatalyst or in sensing applications. SGM films tested for SERRS enhancement of the porphyrin target molecule, TAPP showed over three orders of magnitude enhancement. Immersing the SGM films in a solution containing TAPP results in interaction with RGO and this gets concentrated near the preexisting Ag nanoparticles. Increased concentration and SERS enhancement makes the detection of nanomolar concentration of molecules that exist in solution.

In addition, these composites can also be used to develop new photocatalyst devices for water splitting reaction. The role of Graphene based assemblies in promoting charge separation will be discussed.

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References

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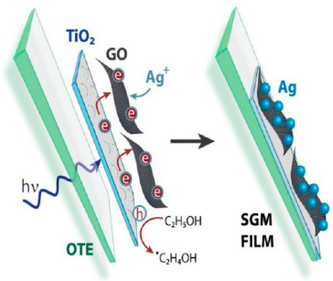

Designing semiconductor-Graphene Oxide-Metal Nanoparticles for SERS substrate. Photogenerated electrons in TiO_2 are transferred across GO film to deposit Ag nanoparticles in a controlled fashion.