

Graphene thickness-controlled Interface for Enhanced Photocatalysis and SERS Applications

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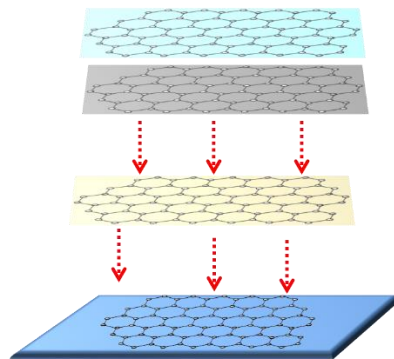
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Abstract:

Graphene has been widely studied in hybrid nanocomposites because of its unique chemical and electrical properties. Graphene thickness at the hybrid interface plays important roles in photocatalytic enhancement and SERS performance, but its enhancement mechanism has not been systematically studied due to the difficulty of controlling graphene hybridization. Our recent work shows that the graphene enhancement in the photocatalysis highly depends on the thickness of graphene with the best performance of three layers graphene stacking at the interface. To verify the thickness effect, we utilized a photo-assisted gold deposition to label the photocatalytic active sites at graphene hybrid surfaces. We also used UV-ozone or oxygen plasma to functionalize graphene hybrid interface. The results exhibit the highly photocatalytic enhancement after the increase of surface hydrophilicity. The numbers of graphene layer are found to govern the gold density and charge transfer efficiency in the graphene hybrid system. In Raman SERS study, the graphene hybrid composites with gold particle deposition have great SERS enhancement with the factor as large as $\sim 10^8$. Our results demonstrate that the enhancement of photocatalysis and SERS is highly associated with graphene thickness in graphene hybrid nanocomposites.

References:

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Graphene-hybridized photopanel (GHP)