

## Hybridized Polydiacetylene Nanocrystals as Potential Photocatalyst

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Polydiacetylene (PDA) nanocrystal is one of the promising materials for low-cost and highly efficient photocatalyst to harvest energy directly from solar irradiation, owing to its suitable band gap in visible region [1]. However, the photocatalytic activity of organic materials reported so far is still relatively low, compared with those of inorganic materials for the practical applications. Surface modification of PDA nanocrystals (NCs) with noble metal nanoparticles (NPs), which may act as a cocatalyst, is expected to significantly enhance the photocatalytic activity, due to the increase in reaction sites, and the decrease in activation energy [2]. In the present work, we will demonstrate the versatile method for surface modification of PDA NCs with noble metal NPs using polydopamine (Dopa) as a binder (Fig.1). The STEM-EDS mapping has reconfirmed that those NPs are indeed silver NPs. The PDA core-Ag shell hybrid system (PDA/Dopa/Ag) has shown significant increase in photocatalytic activity under visible region for photo-degradation of the Rhodamine B (RhB) dye shown in Fig. 2.

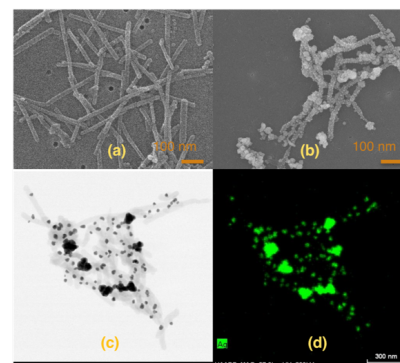


Fig. 1 SEM images of (a) PDA NCs, (b) PDA/Dopa/Ag, (c) TEM image and (d) STEM-EDS mapping of PDA/Dopa/Ag.

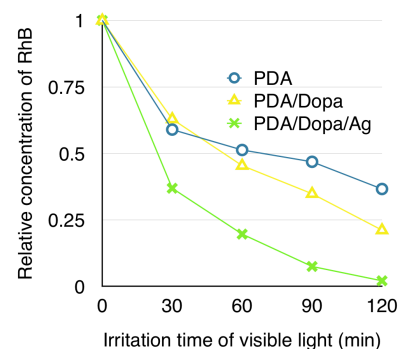


Fig. 2 Comparative photocatalytic activity of PDA NCs, PDA/Dopa, and PDA/Dopa/Ag.

In addition, the enhancement in photocatalytic activity of Dopa-coated PDA NCs (PDA/Dopa) against PDA NCs suggested that Dopa could function not only as a binding layer, but also as a kind of photosensitizer for PDA NCs. Moreover, by introducing the amino and catechol functional groups as a result of Dopa coating, the variety of surface modifications are now possible. Our finding could advance the development of hydrogen generation system using organics and so on in the near future.

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