

Photocatalytic Upcycling of Polystyrene with Quantum Dots

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Plastic is extensively used for numerous fields with high productivity and stability, but its recycling ratio is known to be about 14% and most of them are incinerated or landfilled. These make enormous damage to human beings, such as environmental and economic problems. This study demonstrated the carbon-carbon (C-C) bond decoupling reaction of the plastic model molecule (1,3-Diphenylpropane) to solve this problem. Specifically, hydrogen atom abstraction is driven by several methods, which is known as the rate-determining step of the C-C decoupling reaction. Cadmium sulfide quantum dots (CdS QDs) were used for efficient hydrogen atom abstraction. Furthermore, the polystyrene model molecule was extended to polystyrene polymers whose molecular weight is about 800 and 1300. As a result, CdS QDs showed remarkable performance as photocatalysts and the reason is their unique characteristics such as high dispersity and large extinction coefficients.