Self-assembled TiO_2 nanocrystal clusters for magnetically recoverable photocatalysts

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A facile route for synthesis of nanocrystal clusters of anatase TiO_2 with enhanced photocatalytic activity which are capable of magnetic separation is reported. The hybrid clusters are composed of several Fe_3O_4 nanoparticles as cores distributing within the TiO_2 matrix, an interlayer of SiO_2 on each magnetic nanoparticles as a barrier, and outer layer of TiO_2 nanocrystal clusters. Self-assembled TiO_2 nanocrystals synthesized by one-step solvothermal treatment attribute the mesoporous structure on the outer shell. High temperature and pressure under solvothermal conditions ensured the crystal growth into a well-defined anatase phase without further heat treatment. Enhanced photocatalytic activity was achieved by a high crystallinity and large surface area. In addition, the hybrid clusters can be easily recoverable by external magnetic field and recycled while maintaining their photocatalytic activity.