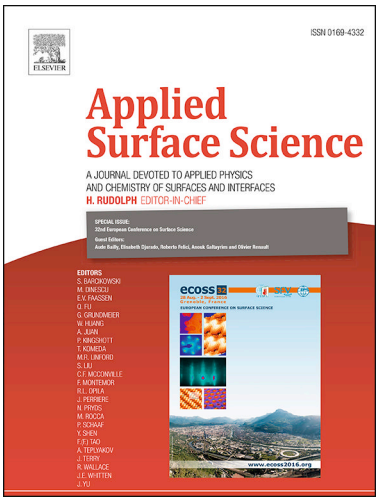

Full Length Article

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Visible-Light Upconversion Carbon quantum dots decorated TiO_2 for the Photodegradation of Flowing Gaseous Acetaldehyde

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ABSTRACT: Carbon-modified photocatalyst has attracted extensive attentions in the field of gaseous pollutant removal, mainly due to the improved adsorption properties and electronic transport of carbon matrix, such as carbon nanotubes, graphene, and fullerene, etc. In this work, carbon quantum dots (CQDs) were employed to enhance the photocatalytic performance of TiO_2-based composites for flowing gaseous acetaldehyde removal. Besides the aforementioned advantages of carbon materials, the unique up-converted photoluminescence property of CQDs is capable of extending the optical absorption to visible-light range. Moreover, the electron spin resonance (ESR) results firstly verified a stable existence of Ti^{3+} in the CQDs/TiO_2 composite, which is possibly induced by the electron migration from CQDs to TiO_2. And the formed Ti^{3+} donor energy level in the band gap could further help with the visible-light harvesting. During the photodegradation experiments, with two-hour continuous flowing gaseous acetaldehyde injection (500 ppm, 20