

## Influence of high energy electron beam treatment on the photocatalytic activity of TiO<sub>2</sub> nanoparticles on carbon fiber

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TiO<sub>2</sub> nanoparticles were grown on carbon fiber by atomic layer deposition (ALD) with TTIP (Ti(OCH(CH<sub>3</sub>)<sub>2</sub>)<sub>4</sub> and H<sub>2</sub>O precursors. After sample surfaces were treated by electron beam (1 MeV, 5 KGy), an improvement in the photocatalytic reactivity of TiO<sub>2</sub> nanoparticles on carbon fiber was observed. An increase in the population of hydroxyl group on TiO<sub>2</sub> particles and the oxidation of carbon fiber were found upon e-beam exposure, whereas there was no noticeable changes of their morphology. It implies that those changes in O and C 1s state of TiO<sub>2</sub> particles/carbon fiber induced by e-beam treatment could be related to the enhancement of the photocatalytic activity. In contrast, when carbon fiber fully covered with TiO<sub>2</sub> thick films was treated with high-energy electron beam under same conditions, the improvement of photocatalytic activity as well as any changes in XPS spectra (Ti 2p, O 1s and C 1s) could not be found.

**Keywords:** High-energy e-beam, Surface treatment, TiO<sub>2</sub>, Atomic layer deposition, Photocatalysis