Synthesis of carbon coated TiO_2 by underwater discharge with capillary carbon electrode.

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The application of plasma discharge in liquids has been studied for many years, because they are useful in removal of chemical or microbial contaminants in water and nanomaterial synthesis. More recently, liquid phase electrical discharge is being developed for several environmental applications. The decomposition of pollutants, such as NO_x and SO_x etc, using TiO_2 photocatalyst has been one of the suggested solution. However, TiO_2 photocatalyst is only responsive to light absorption in the UV and near-UV range, which limits its wide application in visible light range of the solar spectrum. Several methods have been developed to increase the efficiency of the photocatalytic process of TiO_2. One approach is doping, which introdues additional states in the TiO_2 bandgap and thereby increases visible light absorbance. Another method, carbon coated TiO_2 absorb long-wavelength and has also been studied as an anode material for lithium ion battery.

This paper is focused on carbon coating of anatase type TiO_2 by underwater discharge with a capillary in water carbon electrode. The discharge electrode consists of a graphite electrode covered by an alumina tube for insulation and a ground electrode. Electric exfoliation occurs at the graphite electrode surface by capillary discharge in water where hydrogen, oxigen related radicals produced during the discharge assist to these exfoliation phenomenon. The exfolicated carbon flakes have an electric charge and are coated on the TiO_2 surface.

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