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SURFACE PROPERTIES AND ACTIVITIES OF TIO2 PHOTOCATALYST

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Heterogeneous photocatalysis using semiconductor nanoparticles is one of the most outstanding examples of environmental nanotechnology. Since heterogeneous photocatalytic reactions take place on the surface, the surface properties of the semiconductor play a critical role in determining photocatalytic reaction efficiencies and mechanisms. Surface properties of TiO2, the most popular semiconductor photocatalyst, are related with various parameters that include pH, surface hydroxyl group density, particle size, crystalline phase, surface defects, surface metal (e.g., Pt, Au) deposits, and adsorbates or surface complexes. TiO2 surfaces can be actively modified by manipulating the above parameters in order to optimize or control the photocatalytic reactions. In this talk, we will introduce and discuss various examples that show how surface modification influences photocatalytic reactivities and mechanisms of pollutant degradation or conversion. The methods of surface modification of TiO2 include dye sensitization, surface platinization, surface fluorination, silica loading, surfactant adsorption, and nafion coating. The effects of surface modification are widely varying depending on the method and the kind of substrates.