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Photocatalytic activity of TiO_2 treated by EtOH, H_2O and plasma

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Due to the high catalytic activity and good thermal stability, TiO_2 is widely used in various photocatalyst applications. In the present work, the photocatalytic activities of pristine and variously treated Degussa P-25 catalysts were compared. The surface structure and chemical properties were characterized by Brunauer, Emmett & Teller (BET), X-ray diffraction (XRD) UV-vis spectroscopy, and Fouriertrans form infrared spectroscopy (FT-IR). The photocatalytic activity was evaluated by the photocatalytic degradation of methylene blue (MB) under UV irradiation (254 nm) at room temperature. The samples treated by N_2 and O_2 plasma were more effective than commercial TiO_2 in photocatalytic degradation of MB. The photocatalytic activity became even higher when the samples were immersed into water or EtOH and driedprior to the photocatalysis-experiment. The FT-IR spectra indicated form at ion of various water species chemisorbed in TiO_2. The peak at 3400 cm^{-1} and 3200 cm^{-1} were attributed to water molecules on TiO_2 with random (liquid-like) and tetrahedral (ice-like) arrangements, respectively. When the relative amount of liquid-like water increased, photocatalytic activity was enhanced.