【심포지움-광촉매 02】

Photocatalytic Behaviors of TiO_2 Thin Films

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First of all, transparent TiO_2 films in various thicknesses were prepared by sol-gel and MOCVD method, respectively, and their photocatalytic activities in decomposing gaseous 2-propanol were evaluated. It was found that the photocatalytic activities of TiO_2 films were greatly dependent on the film thickness and surface roughness: The photocatalytic activity increases with the increase of film thickness, while it decreases with the increase of surface roughness. We have proposed that these phenomena originate from the transfer of photogenerated electron and hole pairs from the bulk to the surface of TiO_2 film. Several experimental evidences supporting this mechanism have also been provided.

Second, we prepared TiO_2 nanoparticles by hydrothermal reaction of titanium alkoxide stabilized in aqueous solution. The size and crystallinity of particles have been controlled by adjusting the concentration of Ti precursor, the reaction temperature, and the composition of solvent system. The monodispersed TiO_2 nanoparticles controlled in the size of 6~30 nm were applied for the deposition of transparent TiO_2 films, and the fabricated particulate TiO_2 films were then evaluated as photocatalysts in decomposing gas phase organic compounds. It has been found that the photocatalytic activity and the decomposition kinetics are greatly dependent on the size of particles consisting of TiO_2 films. Especially, TiO_2 films derived from 6 nm-particles demostrated much higher photocatalytic activity than that of films from Degussa P25 (particle size:25 nm). We have discussed the effect of particle size in determining the photocatalytic behavior of the derived TiO_2 films.