

Photoionization of TiO₂ Particles Incorporated in Silica Gels Studied by EPR Spectroscopy

Sang Won Ahn* and Kee Hoon Kang

*Temperature group, Korea Research Institute of Standards and Science,
P.O.BOX 102, Yusong, Taejon 305-600, Republic of Korea*

Titanium dioxide particles with three different average size ranges, prepared by three different methods, were incorporated into silica gel pores by impregnation. The titanium dioxide incorporated into the silica gel pores was photoionized by 240-400 nm irradiation at 77 K by a one-photon process to form trapped hole centers on OH group and trapped electron centers on titanium which were detected by electron spin resonance at 77 K. During the impregnation the smallest size range of TiO₂ particles can be incorporated into silica gels with 2.5-15 nm pores. However, the largest size range of TiO₂ particles can only be incorporated into silica gels with 6-15 nm pores and not into silica gels with 2.5-4 nm pores. The photoyield and stability of photoinduced hole and electron centers depends on the silica pore sizes of silica gels and surface area as well as on the TiO₂ loading. In large pore silica gels and large particle size of TiO₂, photoinduced charge separation reach to a plateau at shorter irradiation times and the trapped hole and electron centers are more stable to decay.