

## **Photo-oxidation studies of 4-(chloromethyl)phenyltrichlorosilane on silicon and titanium oxide**

### **ABSTRACT**

The rates of photo-oxidation of 4-(chloromethyl)phenyltrichlorosilane (CMPS) formed on titanium oxide (TiO<sub>2</sub>) and silicon oxide (SiO<sub>2</sub>) substrates were studied. The optimized self-assembly of CMPS films on SiO<sub>2</sub> and TiO<sub>2</sub> were investigated which subsequently used for comparing photochemical reactions by exposing samples under deep UV of 254 nm. Upon the UV irradiation, the tail group of CMPS monolayers; chloro benzyl group is converted to aldehyde group and further exposure leads to the formation of polar group (carboxylic acid) which generates surfaces with a high surface free energy and a hydrophilic character. Analyses of contact angle, Fourier transform infrared and X-ray photoelectron spectroscopy (XPS) were performed to monitor the products generated upon UV irradiation. It was found that highly efficient and rapid photo-oxidation was observed for CMPS on TiO<sub>2</sub>, a complete conversion within minutes compared to CMPS on SiO<sub>2</sub>. The use of TiO<sub>2</sub> has shown that the rate is thrice faster than SiO<sub>2</sub> which is efficient as a photocatalytic oxidation. The resulting carboxylic group terminated surface was subsequently derivatized using 2-amino-1,1,1-trifluoroethane (TFEA). Contact angle and XPS measurements of post-derivatization indicated that the surface functionalization was extensive.

**Keyword:** Self-assembled monolayers, 4-(Chloromethyl)phenyltrichlorosilane, Photo-oxidation, Titanium oxide, Photocatalyst