Chapter 5

Conclusions

A new and effective method for the preparation of Immo-TiO₂ film on the rubber substrate is presented. This method is simple and low cost. The Immo-TiO₂ anatase and Immo-TiO₂ Degussa P25 film samples were prepared by direct mixing of commercial TiO₂ powder with latex and distilled water. Then these Immo-TiO₂ film samples were characterized by scanning electron microscopy (SEM) and X-ray powder diffraction (XRD) techniques. From the SEM images, the Immo-TiO₂ anatase films showed high surface morphology and roughness than the Immo-TiO₂ Degussa P25 films. The surface morphology and roughness of the Immo-TiO₂ anatase film samples increased with the increasing amount of distilled water and the amount of commercial TiO₂ anatase powder but decreased with the increasing amount of latex. Whereas, the surface morphology and roughness of the Immo-TiO₂ Degussa P25 film samples increased with the increasing amount of distilled water and amount of latex but decreased with the increasing amount of commercial TiO₂ Degussa P25 powder. The effect of distilled water strongly influenced the surface morphology and roughness of the film samples which clearly showed the separation of TiO₂ layer from the rubber layer. The physical appearance of TiO₂ anatase (Carlo Erba) was heavy and dense powder with highly agglomerates of TiO₂ particles whereas the Degussa P25 was swelled, light, and dispersed powder. The XRD diffractograms showed a well crystallized anatase form the Immo-TiO₂ anatase film sample similar to the commercial TiO₂ anatase powder whereas the same results was observed for the Immo-TiO₂ Degussa P25 film sample.

The photocatalytic degradation of methylene blue was investigated by using these Immo-TiO₂ film samples and comparison with the commercial TiO₂ anatase (Carlo Erba) and Degussa P25 in powder form. The result showed that, the Immo-TiO₂ anatase film sample had higher photocatalytic activities than the Immo-TiO₂ Degussa P25 film sample. Both commercial TiO₂ samples in powder form

showed higher photocatalytic activities than in the thin film form. However, the latter has some advantages over the former that (1) it is recoverable after use, (2) it can be reused. Moreover, the effect of UV light intensity, the effect of initial concentration of MB, and the effect of pH of MB solution were studied. The results were that the photocatalytic activities of the Immo-TiO₂ anatase film and the Immo-TiO₂ Degussa P25 film increased with increasing UV light intensity and pH of MB solution but decreased with increasing initial concentration of MB solution. In addition, the Immo-TiO₂ anatase film can be "self-cleaning" after used and subsequent use showed no decrease in the photocatalytic efficiencies of the film.