

# **Review and a Research on Green NIR Reflective Pigment**

**Pattana Rakkwamsuk**

*School of Energy, Environment and Materials, King Mongkut's University of Technology*

*Thonburi*

*126 Pracha Utit Rd., Bang Mot, Tung Kru, Bangkok 10140*

Email: pattana.rak@kmutt.ac.th

## **Abstract**

In hot climate regions, large amount of electricity in buildings is consumed by air-conditioning systems. Coating on a building envelope with solar reflective coating can enhance thermal performance of a building. Pigment in the coating plays a major role on its solar reflective property. This talk and presentation will give a review on a development of various NIR/IR reflective pigments. It will also report a development of green-NIR reflective pigments in which  $\text{Cr}_2\text{O}_3$ , a green pigment oxide, was used as the host component and the mixtures of  $\text{Al}_2\text{O}_3$ ,  $\text{V}_2\text{O}_5$  and  $\text{TiO}_2$  were used as the guest components.  $\text{Al}_2\text{O}_3$ ,  $\text{V}_2\text{O}_5$  and  $\text{TiO}_2$  were mixed at different 36 compositions. The mixed samples were calcined at 1150 °C for 4 hours and were ground with an agate ball mill for 7 minutes at a speed of 250 rev/min. Finally, the pigments were sieved to obtain the particle sizes of 0.5 - 2.0  $\mu\text{m}$ . The reflectance for all samples were measured and computed in accordance with the ASTM E891 standard. It was found that a maximum reflectance, in the wavelength ranging between 780 and 2100 nm, of 82.8% was obtained from the sample with a composition of 80% $\text{Cr}_2\text{O}_3$ , 14% $\text{Al}_2\text{O}_3$ , 4% $\text{TiO}_2$  and 2%  $\text{V}_2\text{O}_5$ . The pigment was further investigated when it was used for a production of a ceramic tile. A ceramic glaze was prepared using the pigment at 6%wt. The water at 55.5%wt was added into the pigmented glaze to obtain the slurry with specific gravity of about 1.4. The slurry was then sprayed onto a clay biscuit that was further fired at 1100 °C. Experiments showed that the NIR reflectance of the pigmented glaze slightly dropped to 76.3%. The techniques found from this development can be further employed for other NIR/IR reflective pigments.