

MONITORING THE UV CURING OF POWDER COATINGS

M. Xanthos^{1, 2}, V. Tan², M. W. Young², S. H. Patel²

¹*Otto H. York Department of Chemical Engineering, NJIT, Newark, NJ 07102*

²*Polymer Processing Institute, GITC Building, Suite 3901, NJIT, Newark, NJ 07102*

UV radiation cross-linking of polymer systems is commonly characterized for degree and time of cure by thermal methods such as scanning photocalorimetry. In this work, we modified existing thermal and rheological instruments in order to apply a controllable dosage of UV radiation and compare the curing kinetics and power requirements of two commercial polyester and epoxy powder coating systems with different reported rates of cure. Our results show that the curing characteristics of the powders can be successfully monitored by differential scanning calorimetry and by measuring rheological properties under dynamic mode. The results by the two methods are in good agreement with each other and with manufacturer's published data employing photocalorimetry. Differences in reactivity among different resins can be clearly determined as well as differences in powder requirements. For example, the polyester based powder required much less power to cure and cured ten times faster than the epoxy based system. Both resins showed an optimal cure temperature at 120°C at the proper UV intensity and both could be cured completely within 5 seconds of UV radiation. Curing could also be monitored by FTIR spectroscopy and the time dependent structural changes were found to correlate well to measurable quantities by DSC and rheology.