Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Impact of Nanofillers on the Durability of Polymeric Coatings and Composites LI-PIIN SUNG, STEPHANIE WATSON, AARON FORSTER, Materials and Construction Research Division, National Institute of Standards and Technology, SHENG LIN-GIBSON, Poymers Division, National Institute of Standards and Technology — Metal oxide nanoparticles have been incorporated into polymer systems to improve durability performance properties, for example Ultra Violet (UV) degradation and scratch resistance. In this paper, we present recent research results on (1) the effect of particle dispersion and photorectivity of TiO_2 on the UV degradation of polymeric coatings exposed to high intensity UV radiations at two different humidity conditions; (2) the impact of nano-SiO_2 concentration on surface mechanical properties (surface morphology and scratch behavior) of polymeric coatings and composites. The physical and chemical degradation of the coatings were monitored in periodic intervals using a combination of laser confocal scanning confocal microscopy (LSCM) and attenuated total reflectanceFourier transform infrared spectroscopy. An instrumented nanoindentation and LSCM are utilized to measure surface modulus, perform scratch testing, and map scratch damage patterns. A strong impact on the durability performance in both studies was observed in the presence of nanofillers. Particularly in the scratch resistance study, the addition of nanofillers reduces surface roughness and increase scratch resistance of the nanofiller-polymer composites.

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Date submitted: 11 Dec 2008 Electronic form version 1.4