Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Modification of Substrates for Improved Chemical Bonding at Epoxy Interfaces ANDREW B. SCHOCH, US Army Research Laboratory, DANIEL A. FISCHER, NIST, JOSEPH L. LENHART, US Army Research Laboratory and NIST — Near-edge X-ray absorption fine structure (NEXAFS) is exploited to investigate the interface between epoxy resins and a solid substrate, which is critical for many industrial and defense related composite structures. The goal is to link the interfacial chemistry, structure and resulting properties to the adhesive properties, enabling the design of interfaces with tunable strength, energy dissipation, and impact performance. Silicon surfaces were chosen as a model substrate and were coated sequentially through reactions with glycidyl propyl trimethoxysilane (GPS), various polyoxyalkyleneamines (POAAs), and finally diglycidyl ether of bisphenol-A (DGEBA). By controlling the molecular ratios of the POAAs, which have varying functionality and molecular weight the reactivity of these surfaces toward epoxies can be controlled. In addition to NEXAFS which provides insight regarding the molecular organization and chemistry at the interface, mechanical testing will also be explored to determine the impact on interfacial properties. Asymmetric dual cantilever beam testing was chosen for these samples because it drives the crack to the interface and allows for ease of characterization with surface science techniques after failure. A combination of NEXAFS and XPS will be utilized to interrogate the fracture surfaces and provide insight into the adhesive failure mechanisms and location.

Andrew B. Schoch
US Army Research Laboratory

Date submitted: 01 Dec 2009 Electronic form version 1.4