Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Characterization of the crosslinking reaction in high performance phenolic resins JIGNESHKUMAR PATEL, GUO XIANG ZOU, SHAW LING HSU, university of massachusetts, UNIVERSITY OF MASSACHUSETTS/POLYMER SCIENCE ENGINEERING TEAM — In this study, a combination of thermal analysis, infrared spectroscopy (near and mid) in conjunction with low field NMR, was used to characterize the crosslinking reaction involving phenol formaldehyde resin and a crosslinking agent, Hexamethylenetetramine (HMTA). The strong hydrogen bonds in the resin and the completely crystalline HMTA (Tm = 280 C) severely hamper the crosslinking process. Yet the addition of a small amount of plasticizer can induce a highly efficient crosslinking reaction to achieve the desired mechanical properties needed in a number of high performance organic-inorganic composites. The infrared spectroscopy clarifies the dissolution process of the crystalline crosslinker and the specific interactions needed to achieve miscibility of the reactants. The thermal analysis enabled us to follow the changing mobility of the system as a function of temperature. The low field NMR with the T1 inverse recovery technique allowed us to monitor the crosslinking process directly. For the first time, it is now possible to identify the functionality of the plasticizer and correlate the crosslinked structure achieved to the macroscopic performance needed for high performance organic-inorganic composites.

Jigneshkumar Patel
university of massachusetts

Date submitted: 06 Nov 2015 Electronic form version 1.4