

Deakin Research Online

This is the published version of the abstract:

Hameed, Nishar, Hanley, Tracey and Guo, Qipeng 2011, Analysing ordered nanostructures in epoxy thermosets using small angle X-ray scattering techniques, *in AXAA 2011 : Australian X-ray Analytical Association Workshops, Conference, and Exhibition*, Australian X-ray Analytical Association, [Sydney, N. S. W.].

Available from Deakin Research Online:

<http://hdl.handle.net/10536/DRO/DU:30042284>

Reproduced with the kind permission of the copyright owner

Copyright : 2011, The Authors

OC072

Analysing ordered nanostructures in epoxy thermosets using small angle X-ray scattering techniques

Nishar Hameed¹, Tracey Hanley², Qipeng Guo¹

¹Deakin University, Geelong, ViC, Australia, ²ANSTO, Sydney, NSW, Australia

Small angle X-ray scattering (SAXS) is essential for the morphological investigation of nanostructured systems as it is a bulk sampling technique and provides information about the overall distribution of the components in the system. In our study we have used SAXS to identify various ordered and disordered morphologies in block copolymer modified epoxy thermosets. We have used a reactive block copolymer and hydrogen bonding block copolymer to modify epoxy resin (ER) to see the effect of various blocks on the morphological changes.

The epoxy precursor diglycidyl ether of bisphenol A (DGEBA), curing agent 4,4'-methylenedianiline (MDA) and block copolymers such as poly(dimethylsilicone)-poly(glycidyl methacrylate) (PDMS-PGMA), reactive diblock copolymer and poly(ϵ -caprolactone)-block-poly(dimethyl siloxane)-block-poly(ϵ -caprolactone) (PCL-PDMS-PCL) triblock copolymer were used.

The ordered and disordered nanostructures in the thermosets were investigated at room temperature using SAXS. The SAXS profile for the MDA-cured PDMS-PGMA reactive block copolymer clearly shows The SAXS profile for the PDMS-PGMA reactive block copolymer clearly shows multiple scattering peaks including the integer order peaks, which supports the hexagonal cylindrical morphology. The MDA-cured block copolymer showed cylinders within the lamellar morphology and various other morphologies including lamellae, cubic etc., are observed in ER/PDMS-PGMA thermosets.

In ER/PCL-PDMS-PCL thermosets, the positioning of the spherical microdomains are clear and the transition in nanostructures with respect to temperature was also examined from SAXS results. This is due to the melting of the PCL phase which results in the microphase separated structure of amorphous block copolymer.