Self-assembled Nanoscaled Fibers Prepared by Polymerizable Rod-Coil Oligomer in Thermosetting Blends

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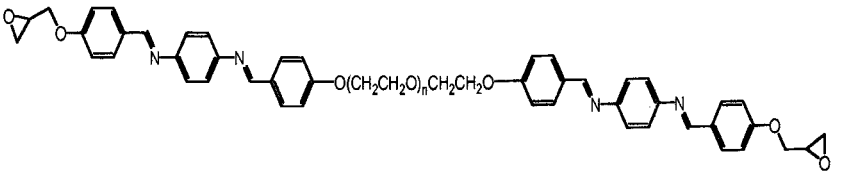
Keywords: Nanoscaled fibers. Rod-Coil oligomer. Thermosetting Blends.

Abstract:

In the present work, we report in the first time that a new method was used to create in situ self-assembled nanoscaled fibers in epoxy resin blends by an epoxy function terminated ABA rod-coil triblock oligomer with a poly(ethylene oxide) midblock and two aromatic azomethine liquid-crystalline endblocks.



Polymerizable liquid crystalline rod-coil-rod oligomers were self-assembled into a nanorod discrete structure in the liquid crystalline phase. Cross-linking of the oligomer in the 3-D ordered state proceeded with the retention of the ordered structure, leading to the formation of crosslinked objects with well-defined shape and size. When further blending the oligomer with epoxy precursor, nanoscaled fibers longitude in um size was observed in the cured samples at states of due to the formation of nanoscaled wire structure by the rod-coil oligomer, suggesting that the macromolecular objects are shape-persistent in epoxy precursor solutions as well as in cured blends. Therefore, the polymerization of reactive nanorod within the confined space and formation of nanoscaled fiber structure in epoxy precursor offers a novel strategy to create shape-persistent nano-objects which could be applied in toughening of thermosetting resin and developing of new functional materials.

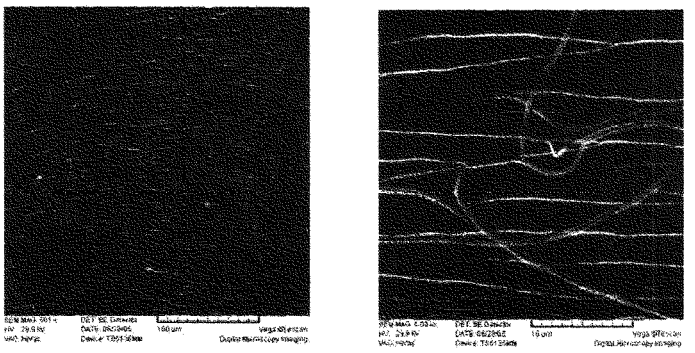


Figure. Scanning electron microscopy of nano-fiber formed in DGEBA/LC-40010%/C11Z cured at 80°C and 140 °C for 5 hours.

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