Tailoring bio-based epoxies for various applications

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Recently, a series of bio-based epoxies derived from diphenolic acid as an alternative to the diglycidyl ether of bisphenol-A (DGEBA) have been synthesized. This family of bio-based epoxies (DGEDP epoxies) differing only in n-alkyl side chain lengths and having similar mechanical properties have been modified for particular use in three applications namely composites, adhesives and coatings. For fiber reinforced composites an appropriate DGEDP was mixed with a bio-based reactive diluent (glycidyl ether of eugenol) in order to decrease system viscosity and increase gelation time without affecting overall mechanical properties. In the case of adhesives, surface energy, failure mechanisms as well as curing kinetics play a dominant role. An appropriate DGEDP epoxy blended with a cashew nut shell liquid toughened epoxy resin (CNSL) was formulated for very fast curing times. A bio-based epoxy modified with thermoplastic polyurethane (TPU) was formulated to obtain toughened self-healing coatings with excellent transparency. This presentation will emphasize how similar epoxies can be tailored for various applications with the appropriate choice of additives and processing technologies.

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