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Cellulose Nanocrystal (CNC) Reinforced Epoxy via Predispersion in Hardener Phases

CNC-enhanced hardening agents overcome the compatibility challenge of utilizing cellulose nanocrystals in polymer matrices, significantly increasing the strength, stiffness, and elongation of epoxy resins for use across various high-performance industries.

Renewable and sustainable natural fiber based composites are becoming increasingly important as structural materials due to the scarcity of fossil fuel and the urgency of environmental protection. Cellulose nanocrystals (CNCs) are an abundant nanomaterial widely used as reinforcing fillers in the field of polymer nanocomposites; however, the hydrophilic nature of CNCs has created difficulties when dispersing them into hydrophobic polymer matrices.

Researchers at Purdue University have developed two part epoxies of three types of CNC-enhanced hardeners for nanocomposite applications. These hardening agents, when mixed with the epoxy, can enhance the mechanical properties of the epoxy resin significantly. These researchers were also able to overcome the hydrophilic vs. hydrophobic drawback by enhancing the hardening agent with CNCs prior to mixing them with the epoxies, rather than trying to inject CNCs directly into epoxy matrices. Applications for these high performance epoxy resins can be found throughout the aerospace, electronics, automobile, and construction industries.

Advantages:

-Simultaneously increases strength, stiffness, and elongation of epoxies

-Overcomes the hydrophilic vs. hydrophobic drawback

Potential Applications:

-Aerospace Industry

-Auto Industry

-Electronics Industry

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Category

Chemicals & Advanced Materials/Polymer Science & Smart Materials

Materials Science & Nanotechnology/Nanomaterials & Nanostructures

Materials Science & Nanotechnology/Composites & Hybrid Materials

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