

Molecularly woven COFs enable threading of polymer chains

Polymer chain entanglement is a key to tune its mechanical behavior. We report three-dimensional, molecularly woven covalent organic frameworks (COFs) that act as scaffolds to thread polymer chains. When incorporated into a polyimide matrix, COF nanocrystals direct chain conformation and adjust intermolecular interactions by forming polymer–COF junctions. Their large pores and interlaced topology organize polymer strands and enable controlled chain unthreading under load, which elevates the composite's strength, ductility, and toughness.

Keywords: Nanocomposites, Nanoparticles, Covalent organic frameworks, Mechanical properties