

Preceramic hairy nanoparticles: Investigating monomer variations of polycarbosilane-grafted nanoparticles

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The aerospace industry is perpetually in search of advanced ceramic materials that can withstand higher temperatures and stress while retaining processability. One novel approach to the creation of such high-temperature materials is through the use of hybrid nanoparticles that can be processed like polymers and subsequently converted into ceramics. We have recently created such hybrids, termed hairy nanoparticles (HNPs) that are composed of a preceramic polycarbosilane polymer brush grafted to a silica nanoparticle core. The present class of HNPs is synthesized via platinum(0)-catalyzed hydrosilylation chemistry. This recently developed preceramic hybrid material displays desirable rheological properties and yields inorganic SiO₂/SiC nanocomposites upon pyrolysis. In this presentation, we will discuss novel polycarbosilane HNP architectures and their chemical and structural properties, as determined by various analytical techniques, including NMR, GPC, TGA, FTIR, and XRD.

