

## **Opportunities and Issues for Controlling Interfaces in Polymer Nanocomposites**

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Ever since the Wright Brothers defied the skeptics of powered flight nearly a hundred years ago, scientists and engineers have been searching for innovative ways to build better aerospace systems. Over the last decade, the utility of inorganic nanoparticles as additives to enhance polymer performance has been established and now provides numerous opportunities for advanced aerospace systems. Notwithstanding these accomplishments, an understanding of the fundamental correlation between nano (1-100 nm) and mesoscale (100-1000 nm) structure, constituent interfacial interactions and ultimate physical, mechanical and thermal properties have only been tentatively examined for a few specific systems, without the possibility for any broad predictive guidelines being discernible. The discussion will highlight challenges associated with the extensive interfacial area (~700-800 m<sup>2</sup>/g) in true polymer nanocomposites and the potential impact of interfacial control on performance by considering recent investigations in stimuli responsive nanocomposites.