

# Polymer Nanocomposites: Correlating Structure with Properties

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## Abstract

Polymer materials are often filled with inorganics to improve their properties. The cases in which the additive exists in the form of a fine nm-sized dispersion within the polymeric matrix, thus producing a *nanocomposite*, allow the investigation of basic scientific problems. At the same time, the behavior of polymers restricted in space or close to surfaces/interfaces can be very different from that in the bulk.

The investigation of the structure, morphology, chain conformations and dynamics of hydrophilic polymers in nanohybrids containing either layered materials or spherical nanoparticles will be presented.[1-3] Mixing polymers with layered additives can lead to intercalated hybrids when the interactions between the constituents are appropriate; these can serve as model systems for the investigation of the static and dynamic properties of macromolecules in nano-confinement. On the other hand, using nanoparticles of largely different sizes provides the opportunity to vary the confining length as well the chain adsorption capacity. The polymer thermal and rheological properties are correlated with the obtained structure in an attempt to understand the relationship between the physicochemical attributes of the constituents and the final properties of the hybrids which is of great importance for the design of new materials. [4] In other cases, polymeric nanohybrids can be utilized as coatings on different substrates for the development of superhydrophobic and water-repellent surfaces, or can lead to surfaces which may possess enhanced self-healing properties.[5-7]

## References

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