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# Learning from Nacre: Constructing Polymer Nanocomposites

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**Abstract**

Due to the small size and special physical properties of nanometer materials, polymer nanocomposites, combined nanoscale reinforcements with polymer matrix, possess outstanding mechanical properties and functional performances, which play a key role in many fields, especially for application in fields of industry and aerospace. However, poor dispersion and weak interfacial interactions are the critical factors that restrict the great improvement in performance of polymer nanocomposites. Although these issues have been solved in some extent *via* various methods, such as surfactant adsorption, polymer wrapping, surface modification, it still remains a great challenge for achieving high performance polymer nanocomposites as theoretically expected. Nacre, with 95 % (volume fraction) inorganic calcium carbonate and 5 % (volume fraction) biopolymers, is a typical binary cooperative complementary material system with hard inorganic component and soft organic matrix. Its typical "brick-and-mortar" hierarchical micro/nano-scale structure provides an excellent guideline for constructing polymer nanocomposites. It skillfully overcomes the bottleneck of traditional approaches for fabricating polymer nanocomposites, such as poor dispersion, low loading, and weak interfacial interactions. Recently, we have successfully demonstrated the bioinspired concept is a successful approach for constructing high performance polymer nanocomposites based on different reinforcement fillers, such as nanoclay, carbon nanotubes, and graphene. The resultant bioinspired polymer nanocomposites (BPNs) show layered hierarchical micro/nano-scale structure and outstanding mechanical properties. This feature article reviews our group’s work and other groups’ research results on BPNs in recent years,