

Bio-inspired Design and Fabrication of Microplatelet-Reinforced Polymer Composites with Superior Mechanical Properties

지동환, 김재윤[†]
성균관대학교

(kimjaeyun@skku.edu[†])

To develop strong tough and damage-tolerant materials, researchers have focused on natural structural materials. Among them, a nacre in a mollusk shell is one of the most attractive material. It is elaborately composed of inorganic platelets and organic polymer matrices with macroscopically layer-by-layer structures, which lead to exceptional mechanical properties. In our study, motivated from this system, we designed and fabricated microplatelet-reinforced polymer composites (film and bulk form) with uniform layer-by-layer microstructures and superior mechanical properties. To achieve such structures, we proposed a novel hydrogel-film casting method that addresses disadvantages of conventional fabrication methods for layer-by-layer structures; it is appropriate for preparing composites with various shapes, thicknesses, and sizes. Through combination of inorganic microplatelets and strong stiff organic matrices in the structure, an integrated strength, stiffness, and toughness was achieved. The design and fabrication strategies would yield engineering composites.