

2D materials-based liquid crystalline hydrogel system for ultrafast layer-by-layer nanocoating

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Addition of nanosheets is one of the most widely used methods to enhance the properties of polymer. While physical or solution mixing is economically attractive because of its simple procedure, it is hard to increase the volume percent of filler materials as the fillers are aggregated and not aligned in the polymer matrix. Another way to improve the performance of polymer composite is by using layer-by-layer (LBL) structure that is formed by depositing alternating polymer and filler layers. However, the LBL procedure is laborious and based on complicated fabrication procedure. We suggest a new and efficient approach to fabricate 2D materials-based LBL nanocoating by using lyotropic liquid crystalline (LC) properties of 2D materials. Because polymer and small molecules can transport quickly within water swollen interlayer galleries, LBL nanocoating can be fabricated in a few minutes. We demonstrated this system with polydopamine, polyimide, and diamines and the nanocoatings were used for flame retardant, gas barrier, and so on.