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Novel Fluorescent High Density Polyethylene Composites for Fused Deposition Modeling 3D Printing in Packaging Security Features

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Abstract : Recently, innovations in packaging security features become more important to see the originality of packaging in industrial application. Luminescent 3d printing materials have been a promising property which can provides a unique opportunity for the design and application of 3D printing. Lack emission of terbium ions, as a source of green emission, in salt form prevent its uses in industrial applications, so searching about stable and highly emitter material become essential. Nowadays, metal organic frameworks (MOFs) play an important role in designing light emitter material. In this work, fluorescent high density polyethylene (FHDPE) composite filament with Tb-benzene 1,3,5-tricarboxylate (Tb-BTC) MOFs for 3D printing have been successfully developed.HDPE pellets were mixed with Tb-BTC and melting extrustion with single screw extruders. It was found that Tb-BTCuniformly dispersed in the HDPE matrix and significantly increased the crystallinity of PE, which not only maintained the good thermal property but also improved the mechanical properties of Tb-BTC@HDPE composites. Notably, the composite filaments emitted ultra-bright green light under UV lamp, and the fluorescence intensity increased as the content of Tb-BTC increased. Finally, several brightly luminescent exquisite articles could be manufactured by fused deposition modeling (FDM) 3D printer with these new fluorescent filaments. In this context, the development of novel fluorescent Tb-BTC@HDPE composites was combined with 3D printing technology to amplified the packaging Security Features.

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