Catecholamine-based Flame Retardant Nanocoating Applied via an Aqueous Graphene Oxide Liquid Crystalline Scaffold

김한임†
한국건설기술연구원
(hanim.kim@kict.re.kr†)

An effective flame retardant (FR) nanocoating was developed by polymerization of dopamine within a liquid crystalline (LC) graphene oxide (GO) scaffold. The LC feature of aqueous GO enables producing uniform coatings on multiple types of surfaces, including macroporous 3D-foam and flat substrates, indicating this coating approach is potentially universal. This system facilitates fast diffusion of dopamine within the interlayer gallery of GO where it can also undergo polymerization into polydopamine (PDA). A periodically stacked PDA/GO nanocoating could be formed after drying the coating. PDA/GO nanocoating exhibited a highly efficient FR performance of PU foam, which can be attributed to the synergistic interplay afforded by the anti-oxidant function of PDA, intumescent char formation of PDA/GO. This nanocoating does not substantially influence the intrinsic mechanical properties of PU foam. Finally, it is hypothesized that the combined strong adhesion of the nanocoating and the reduction of GO to a more hydrophobic reduced GO form significantly enhanced the coating stability in aqueous environments that are expected to be encountered in PU foam applications.