Layer-by-Layer Assembled Heat Dissipation Films of Graphene Oxide Nanosheets and Alumina Nanoparticles

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Graphene is attracting tremendous attention on research field of heat dissipation thin film due to its high thermal conductivity (~5000W/m.K). However, due to the 2D structure of graphene, reduced graphene oxide films exhibit low cross-plane thermal conductivity which is an obstacle to effective heat dissipation as opposed to a high in-plane thermal conductivity. To solve its low cross-plane thermal conductivity problem, we devised nano-scaled multilayer heat-dissipation films that alumina nano particles are inserted between horizontally oriented rGO layers. Alumina particles, relatively high thermal conductivity material (~35W/m.K), can compensate low cross-plane thermal conductivity of rGO. As a result, rGO/Alumina film shows extremely efficient heat dissipation effect by significantly reducing maximum operating temperature of LED. Due to its simple fabrication process and superior thermal properties by spin-assisted layer-by-layer assembly, it is expected that rGO/Alumina film can be applied in not only LED and integrated electronic device but also other heat management.