Binder-free heat dissipation films assembled with reduced graphene oxide and alumina nanoparticles for simultaneous high in-plane and cross-plane thermal conductivites

홍성환, 유필진†
성균관대학교
(pjyoo@skku.edu†)

Grphene is an attractive material for heat dissipation films due to its high thermal conductivity. However, stacked rGO nanosheets generally suffer from low cross-plane thermal conductivity owing to inter-sheet gaps, which is an obstacle for implementing effective heat dissipation films. To resolve this issue, here, we propose multilayered films consisting of GO nanosheets and alumina nanoparticles using a spin-assisted layer-by-layer deposition method. Charged moiety-supplemented alumina nanoparticles are uniformly inserted between horizontally oriented GO nanosheets to compensate for the mitigated thermal transport encountered in GO-only stacked films. By virtue of successful electrostatic binding between GO nanosheets and functionalized alumina nanoparticles, alternately stacked films are readily grown up to 10 ㎛ in thickness. As a result, rGO/alumina films show efficient heat dissipation performances by significantly reducing the maximum operating temperature of 60W LED devices.