

Photothermal Properties of Graphene/Silver Nanoparticles Grating Film

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Plasmonic materials have been studied for enhancement of photothermal conversion properties of solar power energy. In this work, we fabricated graphene/silver nanoparticles (AgNPs) grating films, which exhibited enhanced photothermal properties. Flat AgNPs films were deposited on an aluminum substrate and the AgNPs grating structures were fabricated by a nanoimprinting technique using a Blu-ray disc recordable (BD-R, the grating pitch of 320 nm) or digital versatile disc recordable (DVD-R, the grating pitch of 740 nm) templates. Then, the monolayer of graphene was deposited on the AgNPs grating films for enhancement of photoabsorption on the metallic layers and an enhancement of LSPR and propagating surface plasmon generated on silver nanoparticles grating films. The plasmonic photothermal graphene/silver nanoparticles film was attached with the commercial thermoelectric device, then the plasmonic photothermal effect of AgNPs grating films with/without graphene was studied under irradiation of white light. For the flat AgNPs film showed greater current than that of the evaporated flat Ag film. Furthermore, the results exhibited that the grating structured AgNPs films ($\Lambda=740$ nm and $\Lambda=320$ nm) with graphene showed greater current than that of grating structured AgNPs films without graphene and flat AgNPs films with and without graphene. This indicates that the deposition of graphene on AgNPs grating films leads to an enhancement of the photothermal effect, which should be originated from the interaction between the graphene and 2 plasmonic effects, i.e. simultaneous localized surface plasmon (LSPR) and propagating surface plasmon excitations.

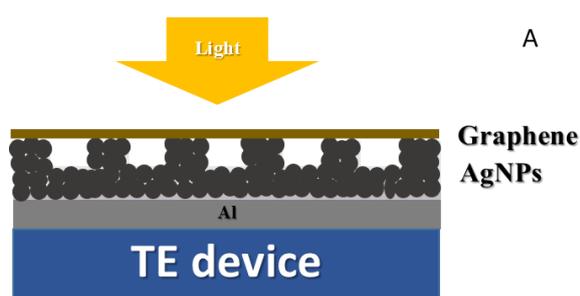


Fig. 1. A schematic of the experimental configuration of graphene/AgNPs grating film.

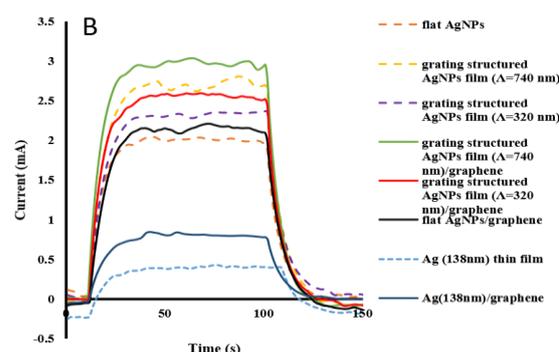


Fig. 2. Current-time properties with/without irradiation of white light on the plasmonic AgNPs films.

References:

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