

Fabrication of Plasmonic Photothermal Metal Nanoparticles Film

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Photothermal materials have been interested in enhancement of power energy devices. In this work, we fabricated the plasmonic photothermal silver nanoparticles (AgNPs) grating films. The AgNPs was deposited on Al substrate by spin-coating. Then, a PDMS mold, which was used as a grating template with grating pitch 740 nm or grating pitch 320 nm, was imprinted on the surface of AgNPs layer. The enhancement of plasmonic photothermal films were attributed from LSPR and propagating surface plasmon generated on the silver nanoparticles grating film. The plasmon excitation in plasmonic photothermal film under an irradiation of white light also increased the thermal heating around surface of metal nanoparticles. To study the photothermal effect, the plasmonic photothermal film was attached on a thermoelectric generation device. The result showed that the flat AgNPs film showed grater current than that of flat Ag film. Furthermore, we found that the grating structured AgNPs film exhibited greater current than that of flat AgNPs film. The plasmonic photothermal grating structured AgNPs films with grating pitch of 740 nm was the best to generate the photothermal current, indicating that the propagating surface plasmon excitation produced the additional heat generation in addition to the localized surface plasmon on the AgNPs. The result indicates the possibility to enhance the photothermal effect by the localized surface plasmon and propagating surface plasmon hybrid system.

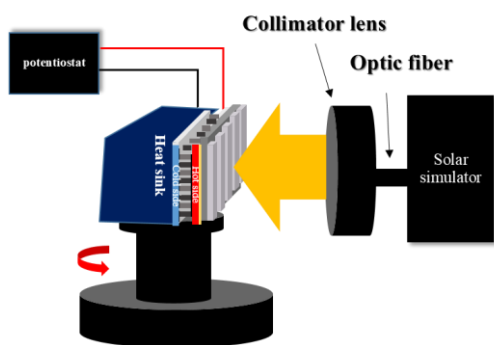


Fig. 1. The experimental setup of thermoelectric measurements for plasmonic photothermal AgNPs film device under the light irradiation.

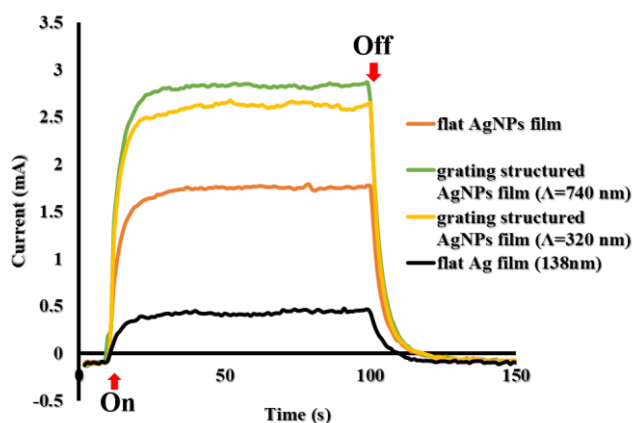


Fig. 2. I-T properties by the irradiation of white light on AgNPs films.

References:

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