PHOTONIC AND PLASMONIC NANOSTCURED TRANSPARENT CONDUCTORS FOR ADVANCED PHOTOVOLTAICS

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Photonic and plasmonic nanostructures have been developed on transparent conductors (TCs) including fluorine-doped Tin oxide thin films and graphene using methods that are applicable to large-scale applications including nanoimprint and colloidal lithography, and thermally-assisted self-assembling. Enhanced light trapping in visible to near infrared spectrum has been demonstrated on these nanostructured TCs. Fine tuning of the performance may be achieved through controlling the materials, geometry, and dimension of the nanostructures, as suggested by theoretical modeling using finite-difference time-domain method and confirmed in experiment. The enhanced light trapping may lead to enhanced light absorption and therefore improved power conversion efficiency in thin film photovoltaics with appropriate interface engineering as demonstrated in this work on dye sensitized solar cells and organic photovoltaic devices.

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