Self-aggregatedAAO nanowire structures for solar energy harvesting

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Dielectric, semiconductor and metallicnanowire structures have attracted considerable interest in photonic,optoelectronic energy harvesting applications. By controlling fabricationparameters, the optical properties of nanowire structures can be varied and appliedwith other materials such as metal or metal oxide. There have been extensiveefforts to enhance the efficiency of solar cells by increasing the lightabsorption using surface textured structures, plasmonic effects with metalnanoparticles, etc. However the plasmonic effects of metal nanoparticlesconvert light energy into thermal dissipation loss in metal, instead of enhancedlight absorption in photovoltaic cells. To overcome this parasitic effect, wepropose simple haze film to enhance photovoltaic cell efficiency.

We demonstrate plasmonic nanowire structuresand optical haze film with self-aggregated nanowire arrays using aluminum oxideand titanium dioxide for solar energy harvesting applications. To fabricate theself-collapsed nanowire structures, we use conventional anodization, wetetching and drying processes. By fabricating aluminum oxide nanowire array film,we can achieve high transmission haze and transparency in UV to NIR spectralrange. Thus we can enhance the power conversion efficiency of solar celldevices. We also sputter metal on aluminum oxide and titanium dioxide nanowirearrays to make plasmonic structures. The plasmonic metafilm showsultra-broadband absorption for the applications of solar stem generation systemwith high efficiency of solar light to heat conversion.