Gold nanoparticles immobilized onto mesoporous SiO2-coated glass-fiber as an efficient photo-thermal layer for solar-to-steam generation

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Recently, interfacial solar to steam generation has attracted researchers due to its capability of producing fresh water with minimum greenhouse gas emissions. So far, several researches on absorbers have been studying, the aim was to improve the overall efficiency along with simplification of the synthesis procedure for industrial applications. In this work, we develop a new generation of absorber for concentrated high sun system by using glass-fiber as the substrate with silicon dioxide (SiO_2) meso-porous coating and immobilize gold nanoparticles (AuNPs) as the absorber. The SiO_2 meso-porous coating increases the surface area and AuNPs can be easily attached to the glass-fibers. The final samples achieve more than 90% light absorption and effectively produce steam with maximum evaporation rate in one sun condition is 1.2 kg/m^2h through simultaneous control of SiO_2 coating conditions and AuNPs content. Moreover, in application to very high sun system, there are no damages to the samples at high temperature condition, indicating the long-term stability of this new generation absorber.