Development of activated carbon based solar absorber for high efficiency solar-driven steam generation

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Solar-driven steam generation has drawn a great attention in various applications such as desalination, water purification and sterilization. Carbon-based materials and plasmonic metal nanoparticles are considered as promising photo-thermal convertors, which are able to absorb the wide range of solar spectrum. In this study, we developed a solar driven steam generation device by using commercially available activated carbons (AC). The AC membrane was fabricated via filtration method on a cellulose paper as a support. Three commercial AC samples with different physical properties of particle shape, specific surface area and pore size were used in this study. To improve adhesion properties of AC onto the support, and to enhance the water uptake, a series of polyelectrolyte additives (PA) were tested. The steam generation efficiencies of AC membranes were measured under 1-3 sun illumination. The maximum steam generation rate was calculated to be 3.81 kg/m2h under 3 sun of illumination. We have investigated the possibility of using AC-based membrane for desalination, and performed the field experiment with A4 sized large area membrane fabricated by spray coating method using AC ink.