

Electronic Supplementary Information (ESI)

Title

Improving interfacial electron transfer and light harvesting in dye-sensitized solar cells by using Ag nanowire/TiO₂ nanoparticle composite films

Authors

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1. Characteristics of AgNWs

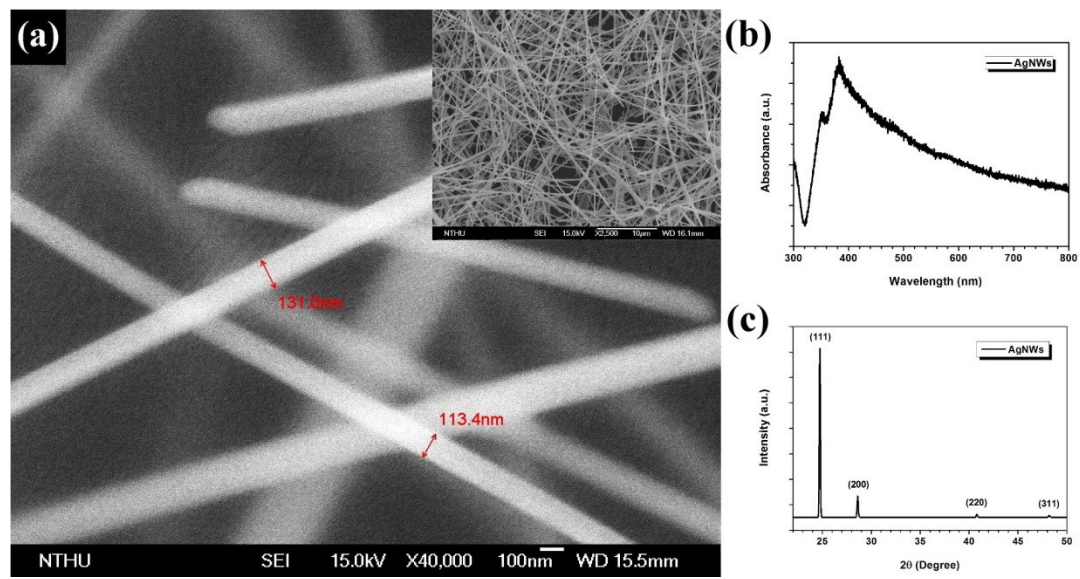


Fig. S1 (a) The SEM image, (b) the UV-vis absorption spectrum and (c) the XRD pattern of the as-synthesized AgNWs.

2. I^-/I_3^- erosion test of AgNWs and AgNWs@TiO₂

To verify the protection of the TiO₂ surface coating against the erosion by I^-/I_3^- electrolyte, the AgNWs with and without TiO₂ surface coating were immersed in the I^-/I_3^- electrolyte for different periods. We utilized XRD to characterize the crystal structure of these samples. For the AgNWs without TiO₂ surface coating, as can be seen in Fig. S2a, the characteristic peaks of Ag disappeared immediately after 5 min immersion. For the AgNWs with TiO₂ surface coating, as can be seen in Fig. S2b, the crystal structure of the AgNWs could sustain after 2 hr immersion. This result demonstrated that the TiO₂ surface coating on the AgNWs could prevent the erosion by I^-/I_3^- electrolyte effectively.

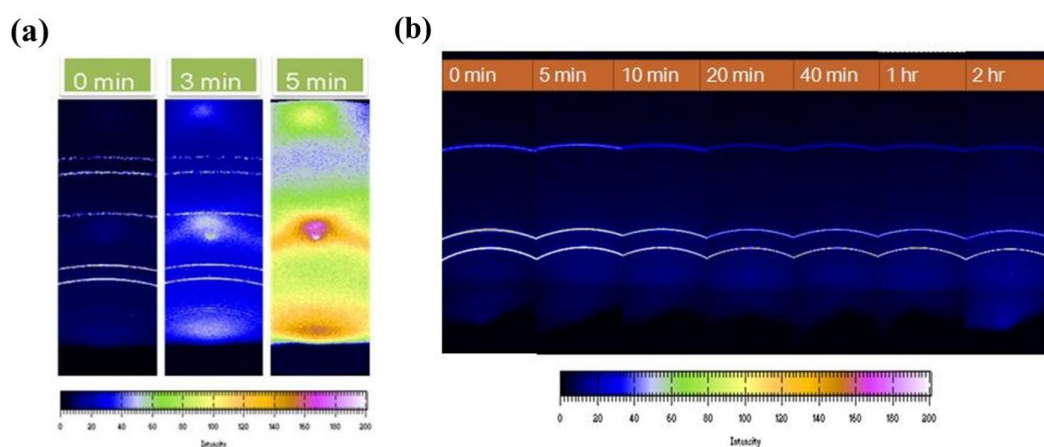


Fig. S2 The XRD patterns of (a) the AgNWs without TiO₂ surface coating and (b) the AgNWs with TiO₂ surface coating immersed in the I^-/I_3^- electrolyte for different periods.

3. Photoanode thin film quality

As compared to the pure P25 thin film (shown in Fig. S4a), the defects such as pores and cracks appeared in the P25 photoanode thin film containing AgNWs@TiO₂ (shown in Fig. S4b). It is hard to analyze these defects quantitatively, however, the film quality of the P25 photoanode thin film containing AgNWs@TiO₂ degraded gradually with increasing the amount of AgNWs@TiO₂ in the P25 thin film as observed. The relatively huge structure of the AgNWs@TiO₂ compared to the P25 matrix would decrease the local interparticle connection. Also, the thermal shrinkage of the surface coated sol-gel TiO₂ could induce the film cracking.

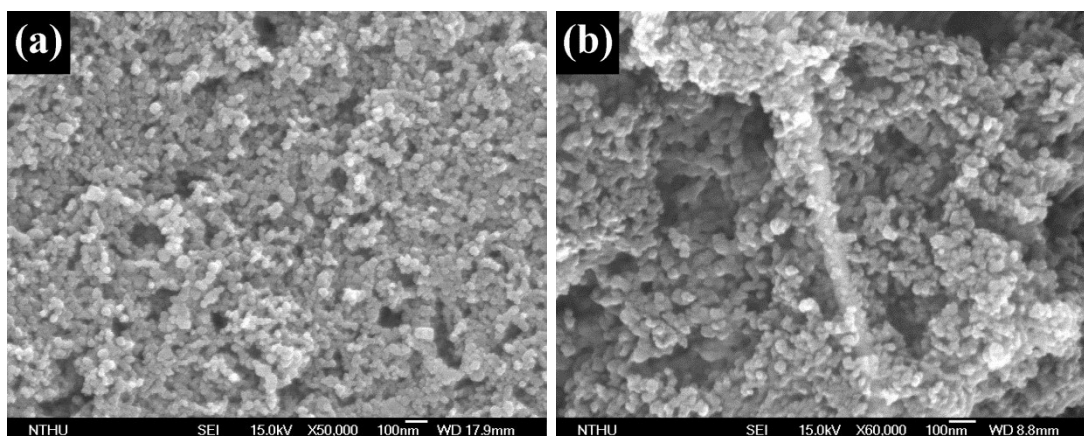


Fig. S3 The SEM images of (a) the pure P25 thin film and (b) the P25 thin film containing AgNWs@TiO₂.

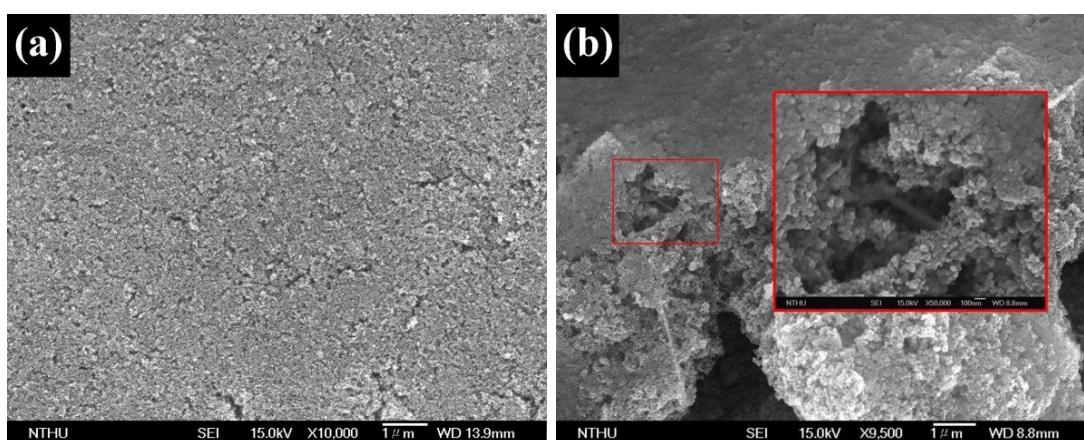


Fig. S4 The SEM images of (a) the pure P25 thin film and (b) the P25 thin film

containing AgNWs@TiO₂. The inset in Fig. S4b is the magnified image of the framed area.