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Supporting Information

A redox-controlled electrolyte for plasmonic enhanced dye-sensitized solar cells

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Plasmonic enhanced DSSCs are generally based on metallic nanostructures.[1] A number of investigations relating to successfully improve the plasmonic effect of DSSCs using Au[2-11] are listed in Table S1. The iodide/triiodide electrolyte containing I^-/I_3^- redox couple was used in these plasmonic enhanced DSSCs. However, none of them dealt with I^-/I_3 corrosion attack on the metallic nanoparticles if the encapsulation failed. Our research confirms that by adding an optimum Au content to the Iodolyte™ AN-50 electrolyte, iodoaurates intermediates are formed, and would readily compensate for the loss of Au nanostructures on the photoanode during DSSC operation, thus preserves the plasmonic effect.

Table S1. Summary of Au nanostructured DSSCs reported with iodide/triiodide containing in electrolyte

Encapsulation	Nanostructure	Size (nm)	PCE Enhanced (%)	Ref.
–	Nanoisalnd	30	57	This work
–	Nanosphere	15	18	[2]
–	Nanosphere	18	19	[2]
–	Nanosphere	36	19	[3]
–	Nanoparticle	<5	27	[4]
–	Nanoisland	9	21	[5]
TiO_2	Nanosphere	100	15	[6]
SiO_2	Nanoprism	20-150	15	[7]
SiO_2	Nanosphere	15	15	[8]
SiO_2	Nanosphere	30-160	37	[9]
SiO_2/TiO_2	Nanoparticle	5	10	[10]
$SiO_2@TiO_2$	Nanoshpere	20	109	[11]

A cycling test on a 0.3 wt% Au DSSC sample was carried out under AM 1.5 solar irradiation. The results are shown in Fig. S1. For the test cell, with 8 h illumination, although the short circuit current density dropped by about 2 $mA \cdot cm^{-2}$, it recovered to nearly 11 $mA \cdot cm^{-2}$ in the next cycle after 8 h in total darkness. In other words, once the DSSC is in operation, deposition of Au nanoparticles starts at the mesoporous TiO_2 photoanode. The deposited Au will gradually dissolved back to the electrolyte when the DSSC is idle, and redeposition starts once again in the next operation cycle.

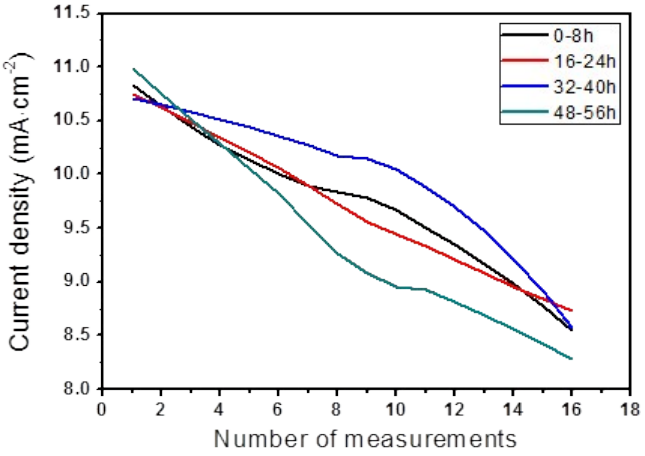

Fig. S1. J_{sc} of cycling test of plasmonic enhanced photoanode with 0.3 wt% Au RCE.

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