Electronic Supplementary Material (ESI) for RSC Advances.

Supplementary information

Facile synthesis of Bi_2S_3-C composite microspheres as low-cost counter electrodes for dye-sensitized solar cells

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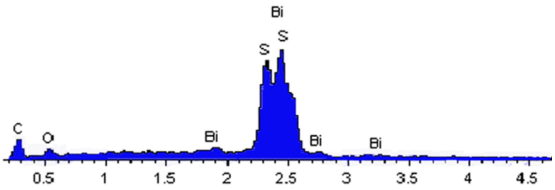

Fig.S1 EDS of the Bi_2S_3-Ccomposite material.

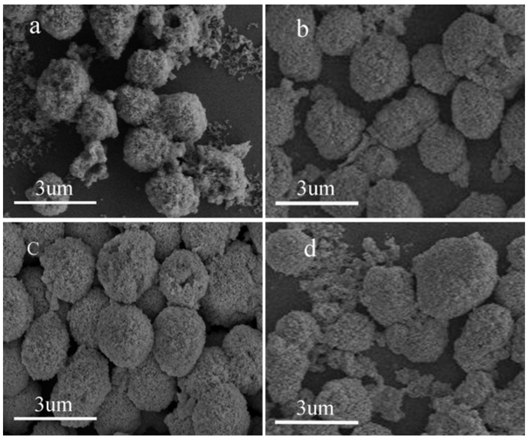

Fig.S2 SEM images of (a) Bi_2S_3-0.39-C (b) Bi_2S_3-0.77-C (c) Bi_2S_3-1.53-C and (d) Bi_2S_3-2.28-C.

The effect of the contents of carbon on the morphology of Bi_2S_3-C was investigated by SEM. As shown in Fig. S2, all of the samples exhibits the structure of porous microspheres. But the samples of Bi_2S_3-0.77-C and Bi_2S_3-1.53-C possess relativity homogeneous microspheres than the samples of Bi_2S_3-0.39-C and Bi_2S_3-2.28-C. This suggests that incorporation of suitable carbon is beneficial to gain homogeneous Bi_2S_3-C microspheres.

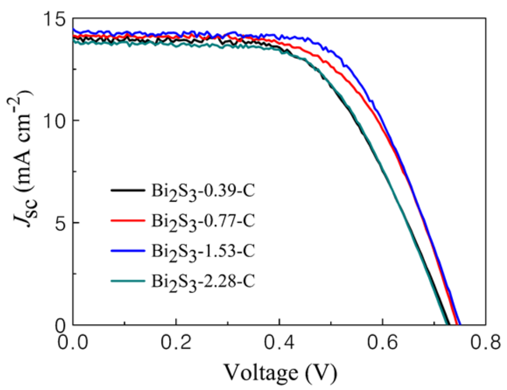

Fig.S3 *J*-*V* curves of DSSCs fabricated with different CEs of various contents of carbon.

Fig. S3 depicts the *J*-*V* curves for different CEs of various contents of carbon. The conversion efficiency of different samples are 5.89%, 6.36%, 6.72% and 5.88%, respectively. It can be found that the conversion efficiency of DSCCs increased with increasing the carbon content from 0.39 wt.% to 1.53 wt.%, and then decreased with further increasing the carbon content. This indicates that the catalytic abilities can be improved by the incorporation of suitable carbon.

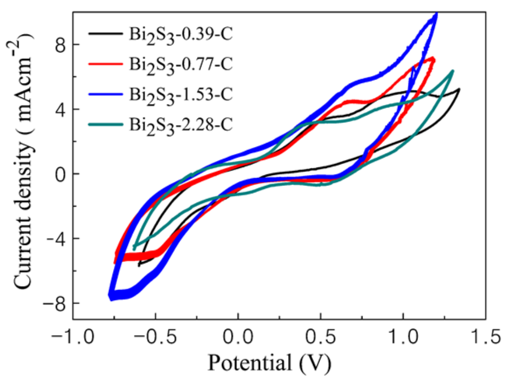

Fig.S4 Cyclic voltammograms (CVs) for the Bi_2S_3-C electrodes with different carbon contents.

Fig. S4 presents CV curves of the Bi_2S_3-C electrodes with different carbon contents. Obviously, the sample of Bi_2S_3-1.53-C demonstrates a superior catalytic activity than the other samples.

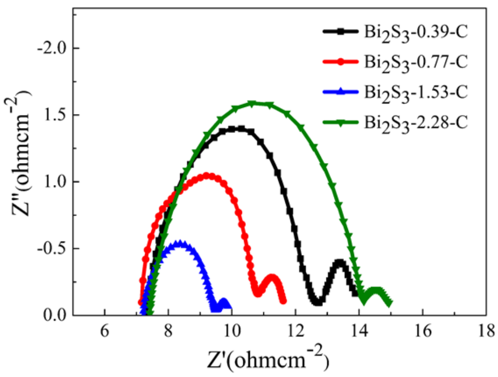

Fig.S5 Nyquist plots of EIS for symmetric cells fabricated with different CEs of various carbon content.

Fig. S5 shows the EIS for symmetric cells with CEs of different contents of carbon. Particularly, the sample of Bi_2S_3-1.53-C demonstrates a smallest R_{ct} among all hybrid electrode, hinting excellent electrocatalytic activity.

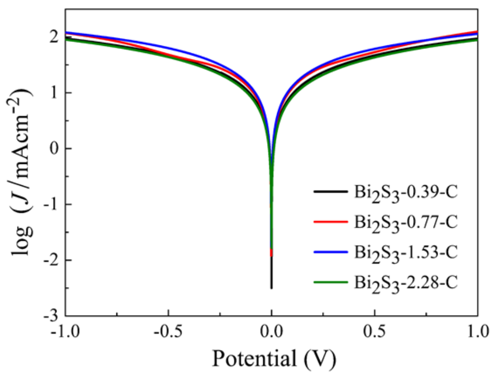

Fig.S6 Tafel-polarization curves for different CEs of various contents of carbon.

Fig. S6 exhibits the Tafel-polarization curves for different CEs of various contents of carbon. It can be found that the composite CE with 1.53wt.% carbon content show the largest J_0 and highest J_{lim} than other samples, which indicates the sample of Bi_2S_3-1.53-C demonstrate the most excellent catalytic activity for I_3^- reduction.