Supporting Information

Ag_2S nanoparticle-decorated MoS_2 for enhanced electrocatalytic and photoelectrocatalytic activity in water splitting

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Table S1 Weight of MoS_2 and $AgNO_3$ for preparation of Ag_2S-MoS_2 composites, and component molar ratio in the product deduced from EDS analysis (see Fig. S1).

	MoS_2 (g)	$AgNO_3$ (g)	EDS result: Ag_2S/MoS_2 (molar ratio, %)	Sample name
1	0.1600	0.0085	4.98	5%A@M
2	0.1600	0.0170	10.76	11%A@M
3	0.1600	0.0204	12.39	12%A@M
4	0.1600	0.0238	14.16	14%A@M
5	0.1600	0.0272	16.30	16%A@M
6	0.1600	0.0306	18.54	19%A@M
7	0.1600	0.0340	23.29	23%A@M

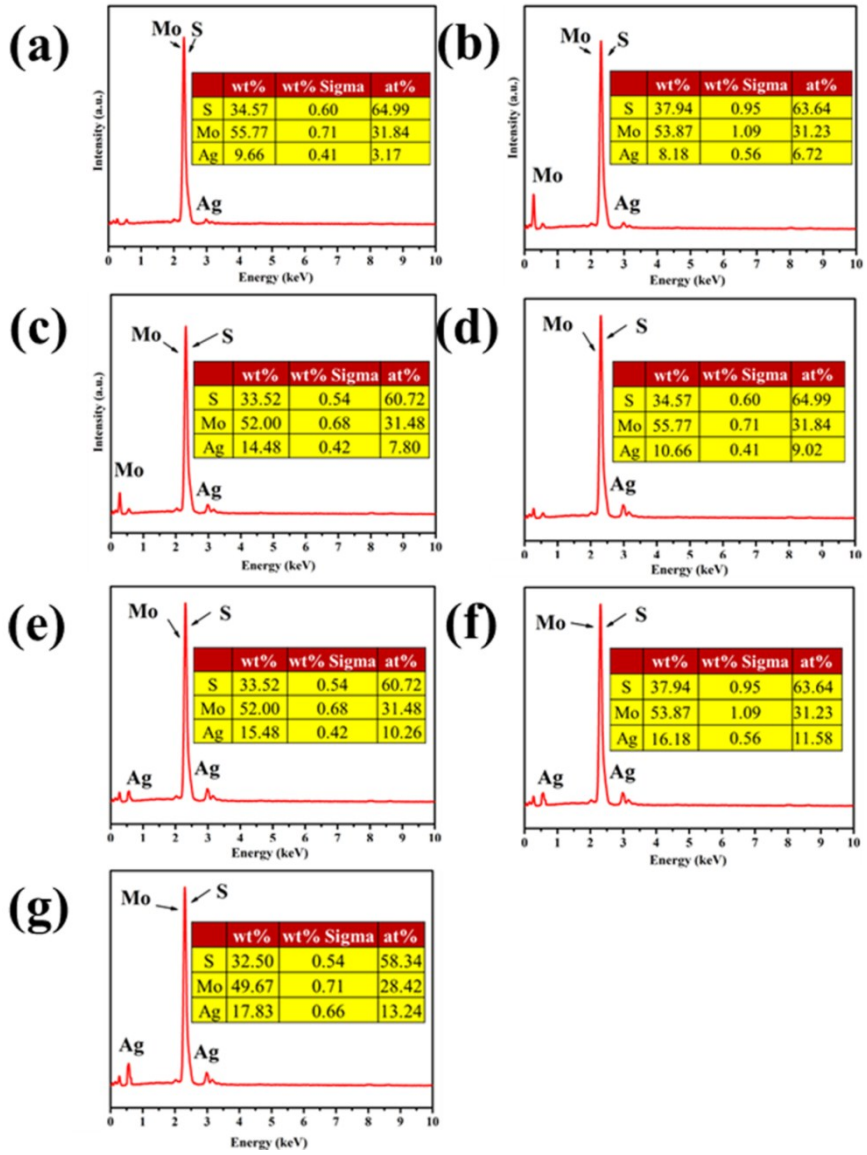

Fig. S1 The EDS analysis of Ag_2S-MoS_2 composites: (a)-(g) correspond to the sample number 1-7, respectively.

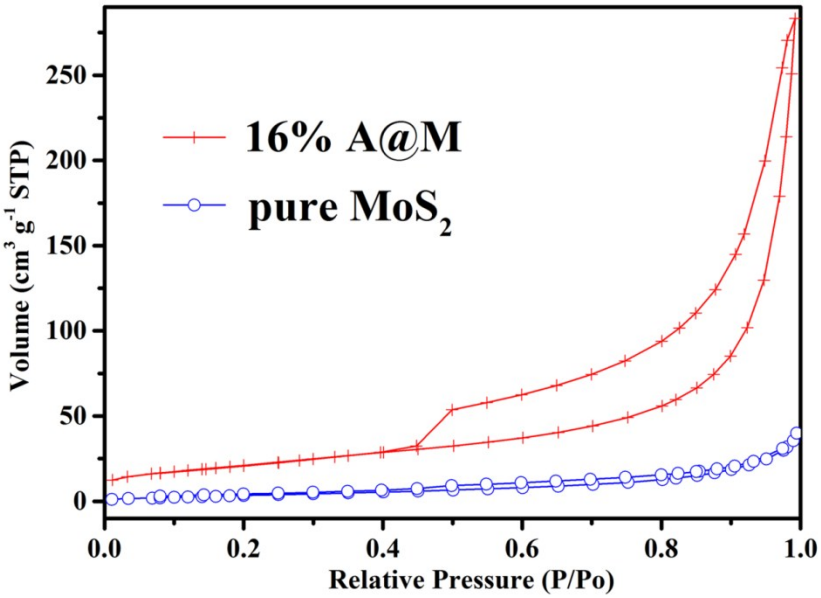

Fig. S2 N_2 adsorption/desorption isotherm curves of pure MoS_2 and the 16% A@M composite.

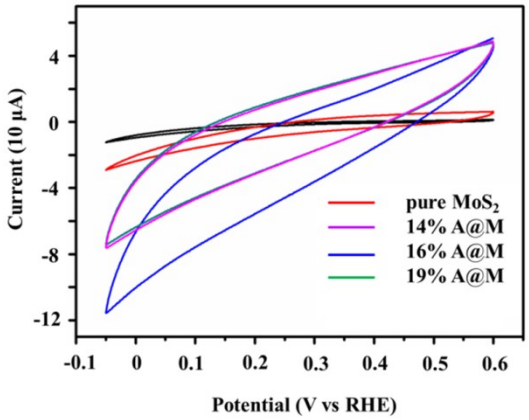

Fig. S3 Cyclic voltammograms (CV) of pure MoS_2, 14%A@M, 16%A@M, and 19%A@M recorded with the scan rate of 50 mV s^{-1}.

Cyclic voltammograms (CV) of pure MoS_2, 14%A@M, 16%A@M and 19%A@M were recorded with the scan rate of 50 mV s^{-1} (Fig. S3). The total voltammetric charges were obtained by integrating the respective CV curves, which was then divided by two assuming the one electron redox process. The value was further divided by the Faraday constant to get the number of active sites (A).[1,2] The per-site turnover frequencies were calculated according to the equation of $TOF = \frac{1}{2FA}\frac{I}{}$, in which I is the current (in A) at η = 200 mV during the linear sweep measurement (Fig. 4a in the manuscript), F is the Faraday constant (in C mol^{-1}), and A is the content of active sites (in mol), respectively.

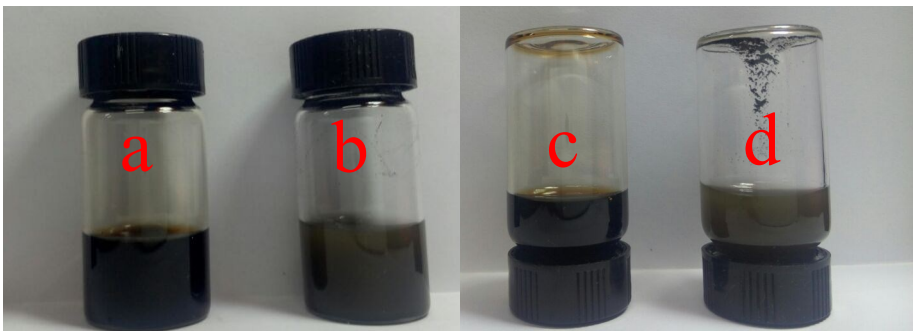

Fig. S4 Photos of MoS_2 (a,c) and Ag_2S (b,d) dissolved in water (0.2 mg mL^{-1}) with 10 min sonication treatment.

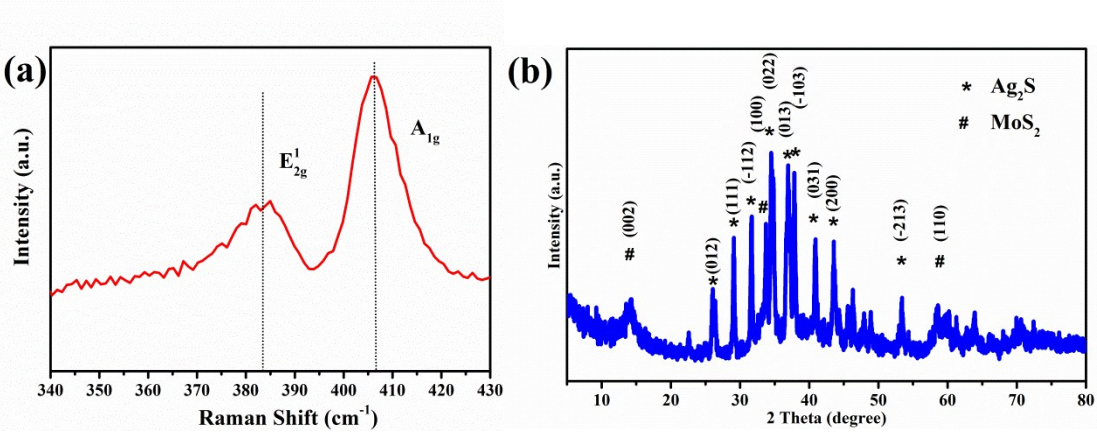

Fig. S5 (a) Raman spectrum and (b) XRD pattern of the used 16%A@M.

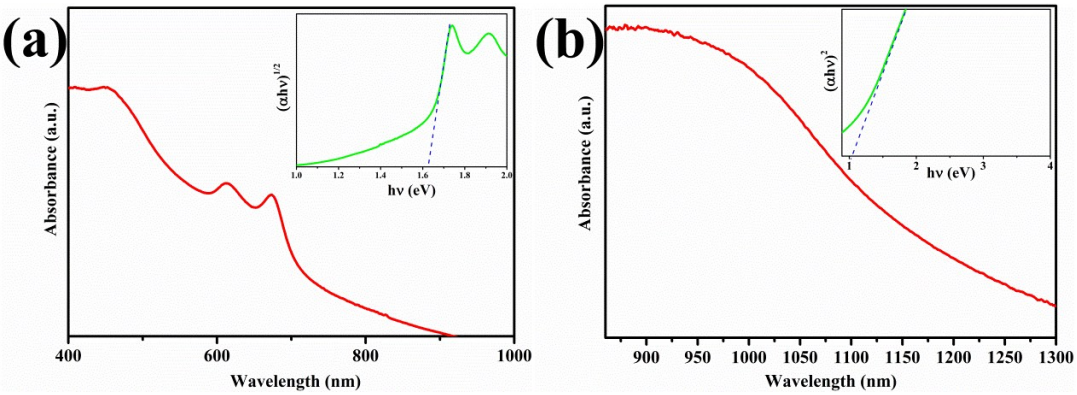

Fig. S6 Absorption spectra of (a) pure MoS_2 and (b) pure Ag_2S. Insets: Tauc plots of (a) pure MoS_2 and (b) pure Ag_2S, respectively.

References:

1 D. Merki, S. Fierro, H. Vrubel and X. L. Hu, *Chem. Sci.*, 2011, **2**, 1262-1267.

2 Y. Yan, X. M. Ge, Z. L. Liu, J. Y. Wang, J. M. Lee and X. Wang, *Nanoscale*, 2013, **5**, 7768-7771.