energies

Supplementary Materials

Carbon Dioxide Conversion with High-Performance Photocatalysis into Methanol on $NiSe_2/WSe_2$

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1. XRD of synthetized WSe_2

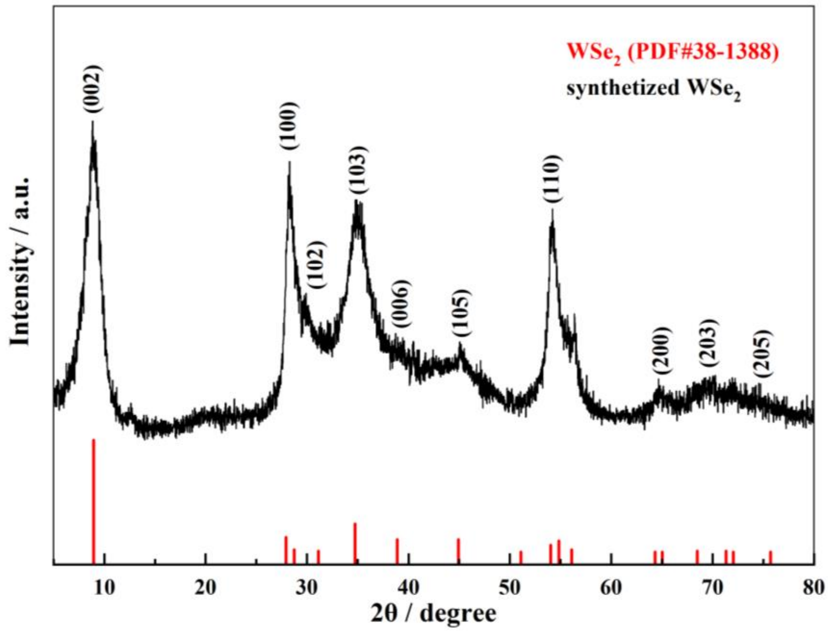

Figure S1. XRD of synthetized WSe_2.

XRD of synthetized WSe_2 is shown in Figure S1. It can be clearly seen from the pattern that the positions of the main diffraction peaks of the synthesized WSe_2 coincide with the characteristic peaks of the hexagonal WSe_2 (JCPDS cards, PDF#38-1388). The positions of the diffraction peaks, as marked in the figure, are 13.54°, 31.57°, 34.55°, 37.76°, 41.64°, 47.35°, 55.67°, 65.29°, 69.14° and 76.33° respectively, which correspond to the (002), (100), (102), (103), (006), (105), (110), (200), (203) and (205) crystal surface of WSe_2. This phenomenon signifies the pure WSe_2 has been successfully synthesized.

2. XPS of synthetized WSe_2

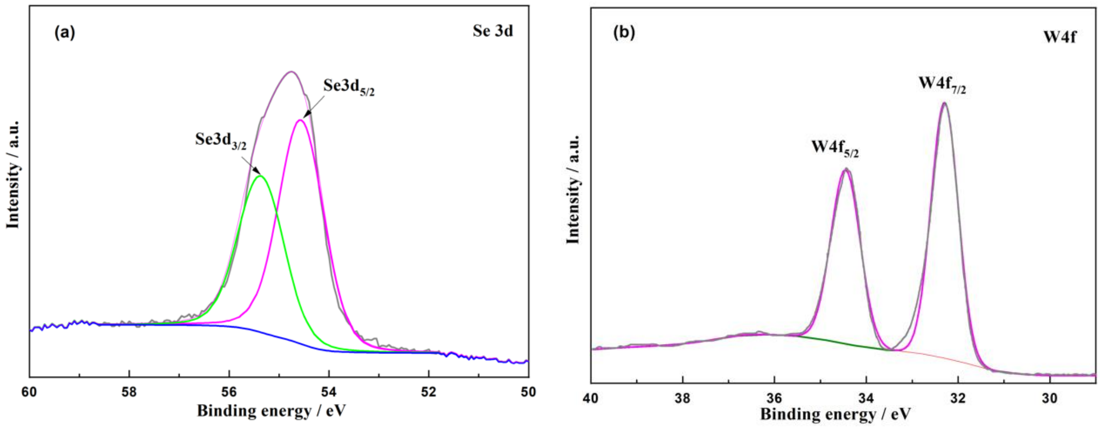

Figure S2. XPS of synthetized WSe_2.

XPS of synthetized WSe_2 is shown in Figure S2. The energy spectrum of Se is shown as figure (a). Peaks locate at 54.6eV and 55.4eV belong to $Se3d_{5/2}$ and $Se3d_{3/2}$, which in turn proves that Se atom exists as Se^{2-} [1]. The energy spectrum of W is shown as figure (b). Peaks locate at 32.05eV and 34.45eV belong to $W4f_{7/2}$ and $W4f_{5/2}$, which in turn proves that W atom exists as W^{4+} [2]. These outcomes all contribute to the conclusion that the synthesized compound is turns out to be WSe_2.

3. Comparaison of the methanol yields between the work and literatures

Table S1. Comparaison of the methanolyields between the work and literatures

No.	Catalyst	Methanolyields	Resource	Remark
1	$g\text{-}C_3N_4/ZnO$	0.6 mmol h^{-1} g^{-1}	[3]	
2	ZnV_2O_6/pCN	3742.19 umol g^{-1}	[4]	
3	$CdS/g\text{-}C_3N_4$	1352.07 umol h^{-1} g^{-1}	[5]	
4	Cuo/TiO_2	1600 umol$h^{-1}g^{-1}$	[6]	
5	$BiVO_4$/rGO	513.1 μmol/L	[7]	
6	Bi_2S_3/TNT	224.6 umol g^{-1}	[8]	
7	WSe_2	1.07 mmol g^{-1}, 10h	The work	500℃ Annealing
8	$NiSe_2/WSe_2$	3.80 mmol g^{-1}, 10h	The work	500℃ Annealing

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