

Supplementary Data

Controlling the Flake Size of Bifunctional 2D WSe₂ Nanosheets as Flexible Binders and Supercapacitor Materials

Pawin lamprasertkun^{a, b, *}, Wisit Hirunpinyopas^c, Varisara Deerattrakul^d, Montree Sawangphruk^b, Chakrit Nualchimplee^a

^aDepartment of Physics, Faculty of Sciences and Liberal Arts, Rajamangala University of Technology Isan, Nakhon Ratchasima, 30000, Thailand.

^bDepartment of Chemical and Biomolecular Engineering, School of Energy Science and Engineering, and Centre of Excellence for Energy Storage Technology (CEST), Vidyasirimedhi Institute of Science and Technology, Rayong, 21210, Thailand

^cDepartment of Chemistry, Faculty of Science, Kasetsart University, Bangkok 10900, Thailand.

^dDepartment of Chemical Engineering, Faculty of Engineering, Kasetsart University, Bangkok 10900, Thailand.

Keyword: WSe₂, liquid phase exfoliation, Flakes Size, Binder, Supercapacitor

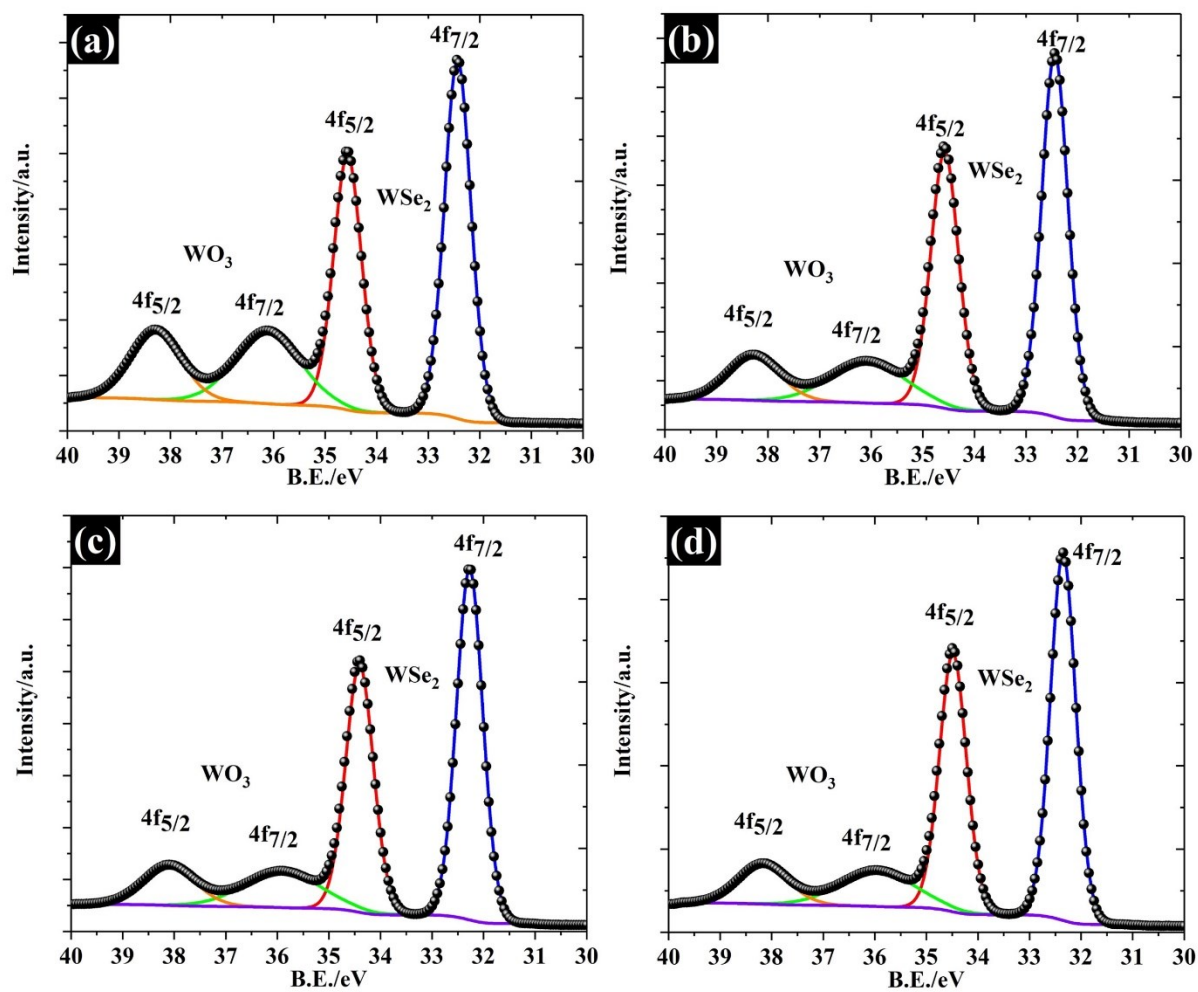


Fig. S1. The W4f XPS spectra of the different centrifugation speeds (a) 0.0-1.5 k, (b) 1.5- 3.0 k, (c) 3.0-6.0 k, and (d) 6.0-12.0 k.

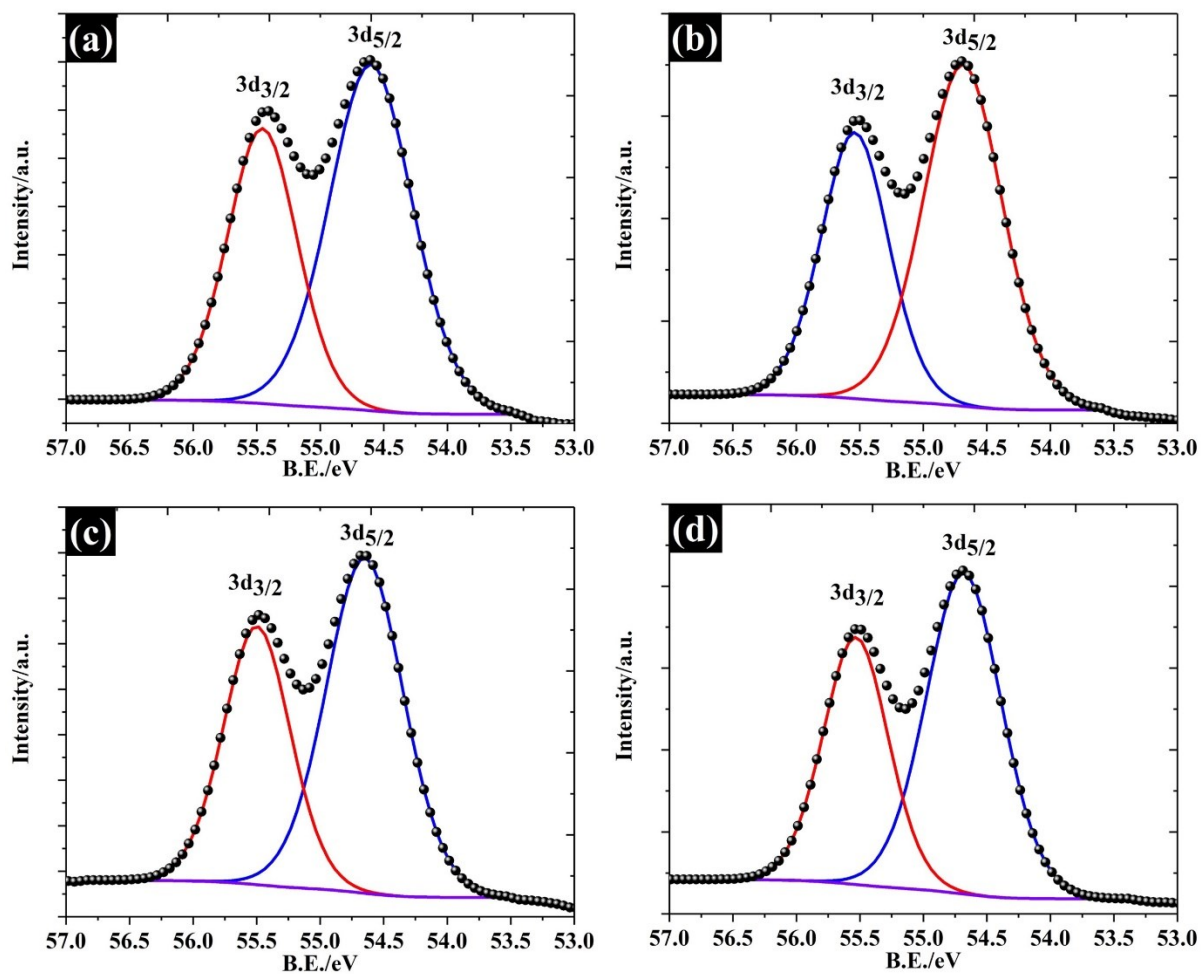


Fig. S2. The Se3d XPS spectra of the different centrifugation speeds (a) 0.0-1.5 k, (b) 1.5- 3.0 k, (c) 3.0-6.0 k, and (d) 6.0-12.0 k.

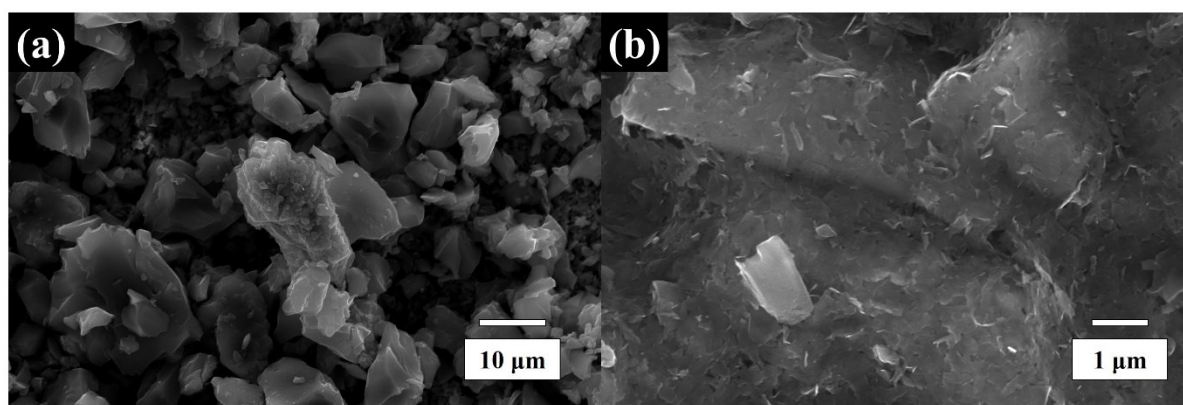


Fig. S3: the SEM images of the prepared electrodes (a) activated carbon without WSe_2 binder, and (b) activated carbon with WSe_2 binder.

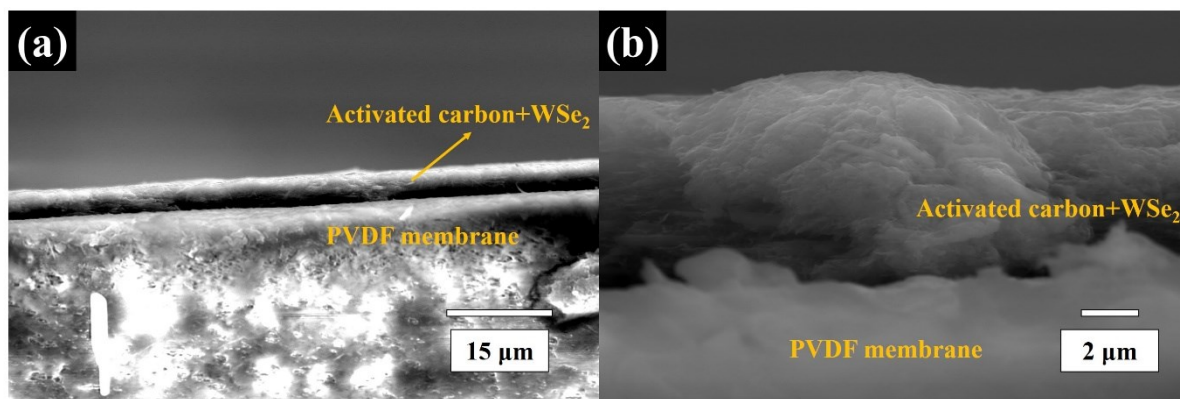


Fig. S4: the cross-sectional SEM images of the prepared activated carbon with WSe₂ binder (a) low magnification, and (b) high magnification.

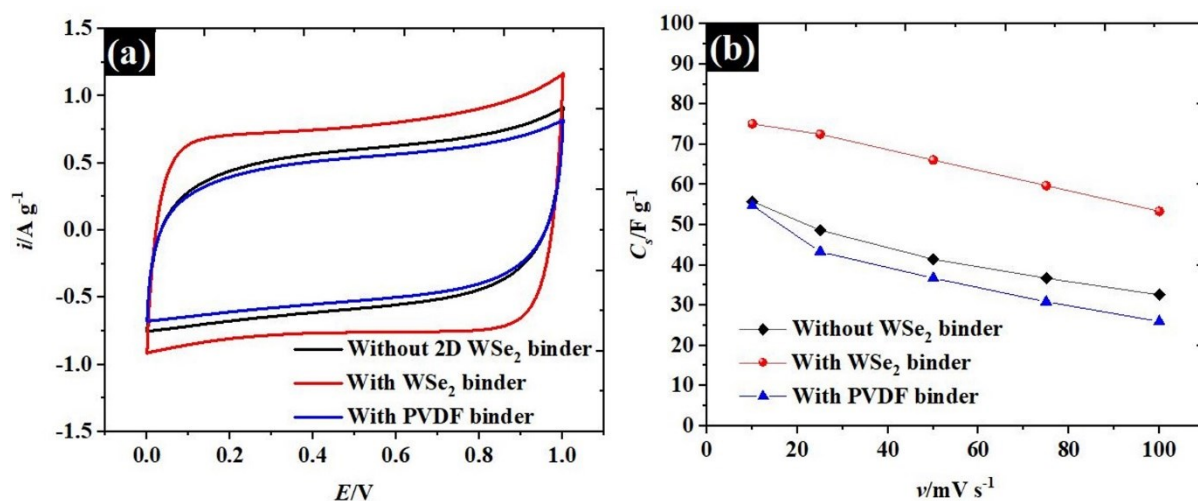


Fig. S5: the electrochemical performance of the as-prepared activated carbon electrode with 10 % of PVDF as a binder compared with the candidate electrodes.

Table 1. The electrical conductivity of WSe₂ and prepared electrodes.

Samples	R/ Ω	A/cm ²	L/ μ m	σ /S m ⁻¹
WSe ₂ (106 nm)	2.88	0.762	2.48*	0.01126
WSe ₂ (255 nm)	3.01	0.762	2.48*	0.01081
WSe ₂ (295 nm)	3.02	0.762	2.48*	0.01074
WSe ₂ (396 nm)	8.44	0.762	2.48*	0.00385
WSe ₂ (955 nm)	47.2	0.762	2.48*	0.00068
AC+WSe ₂	2.69	0.762	6.42**	0.03129

*the thickness of the electrode were obtain from the linear function between thickness and mass of TMDs materials (see ACS Nano 2017, 11, 11, 11082–11090)

**the thickness of the electrode was obtain from cross-sectional SEM image in Fig. S4