

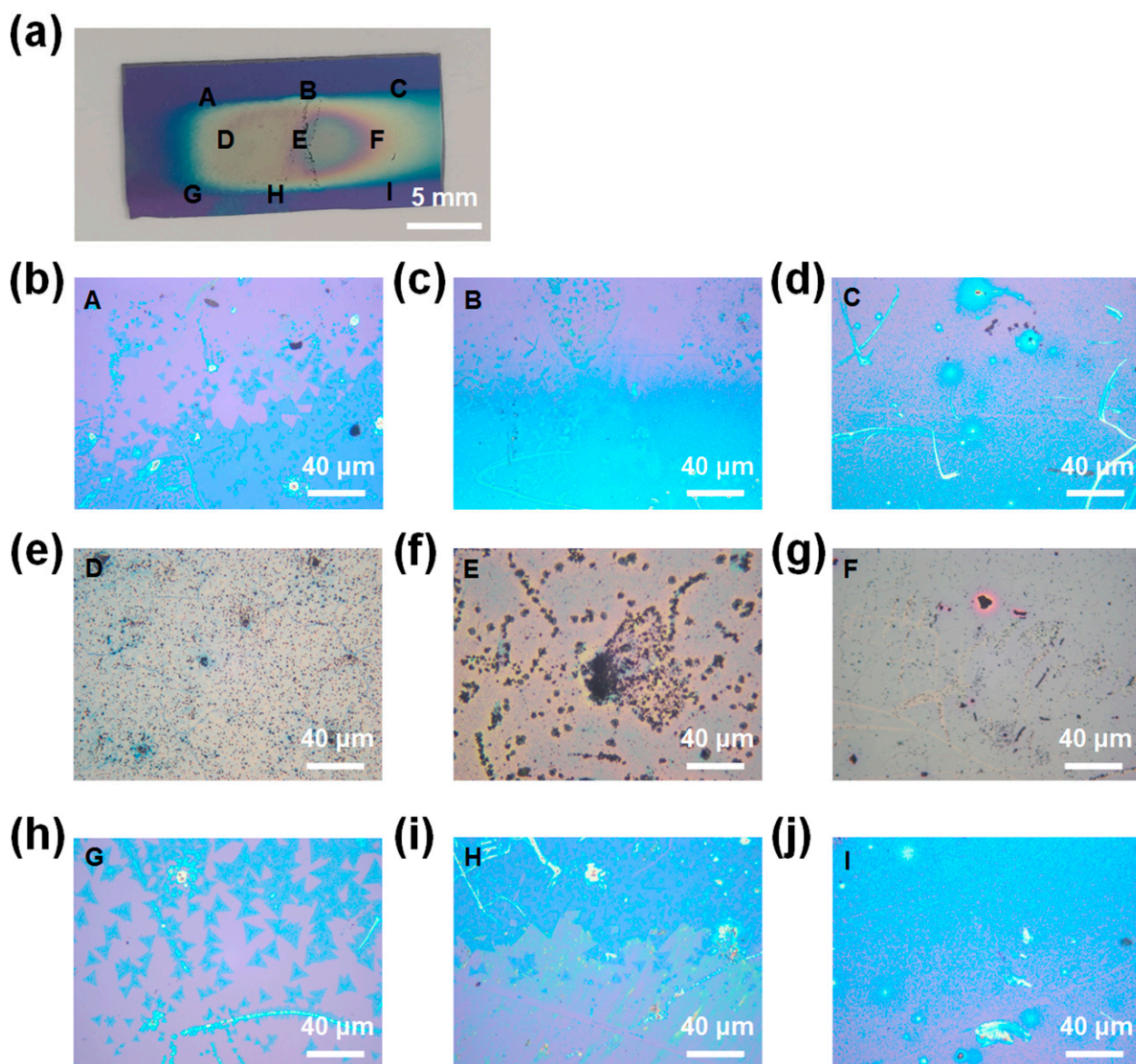
# A Novel Carbon-Assisted Chemical Vapor Deposition Growth of Large-Area Uniform Monolayer MoS<sub>2</sub> and WS<sub>2</sub>

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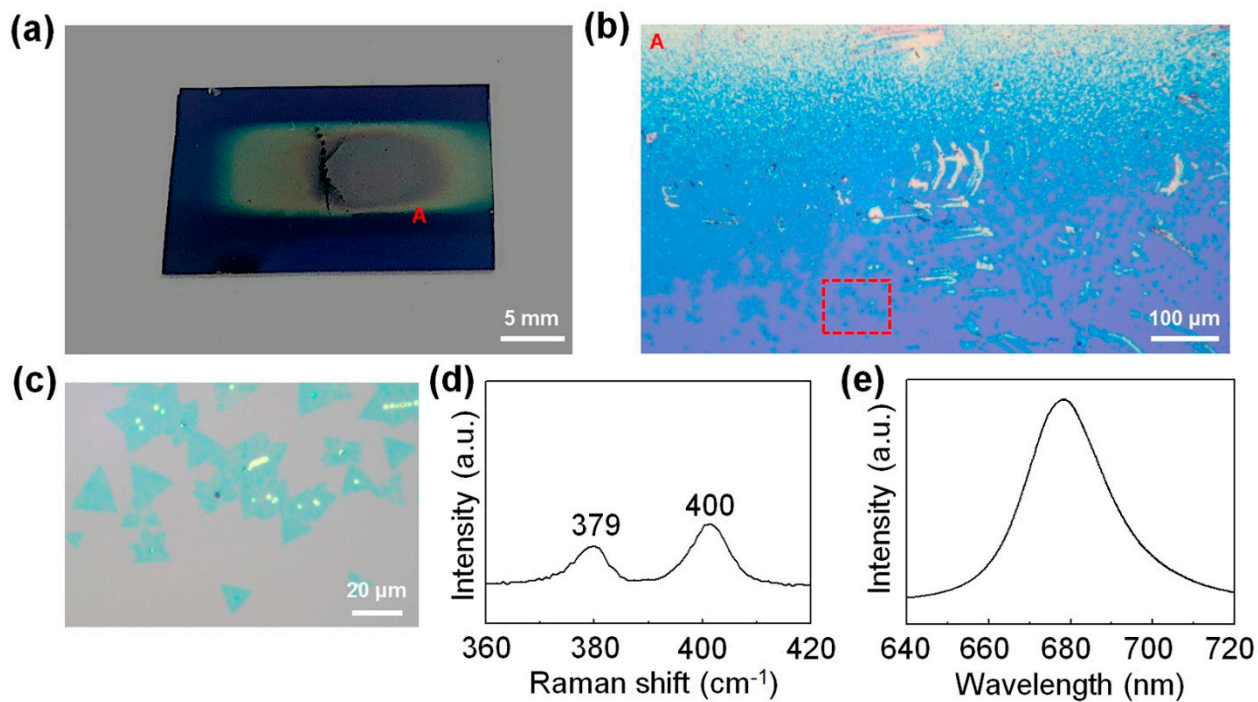
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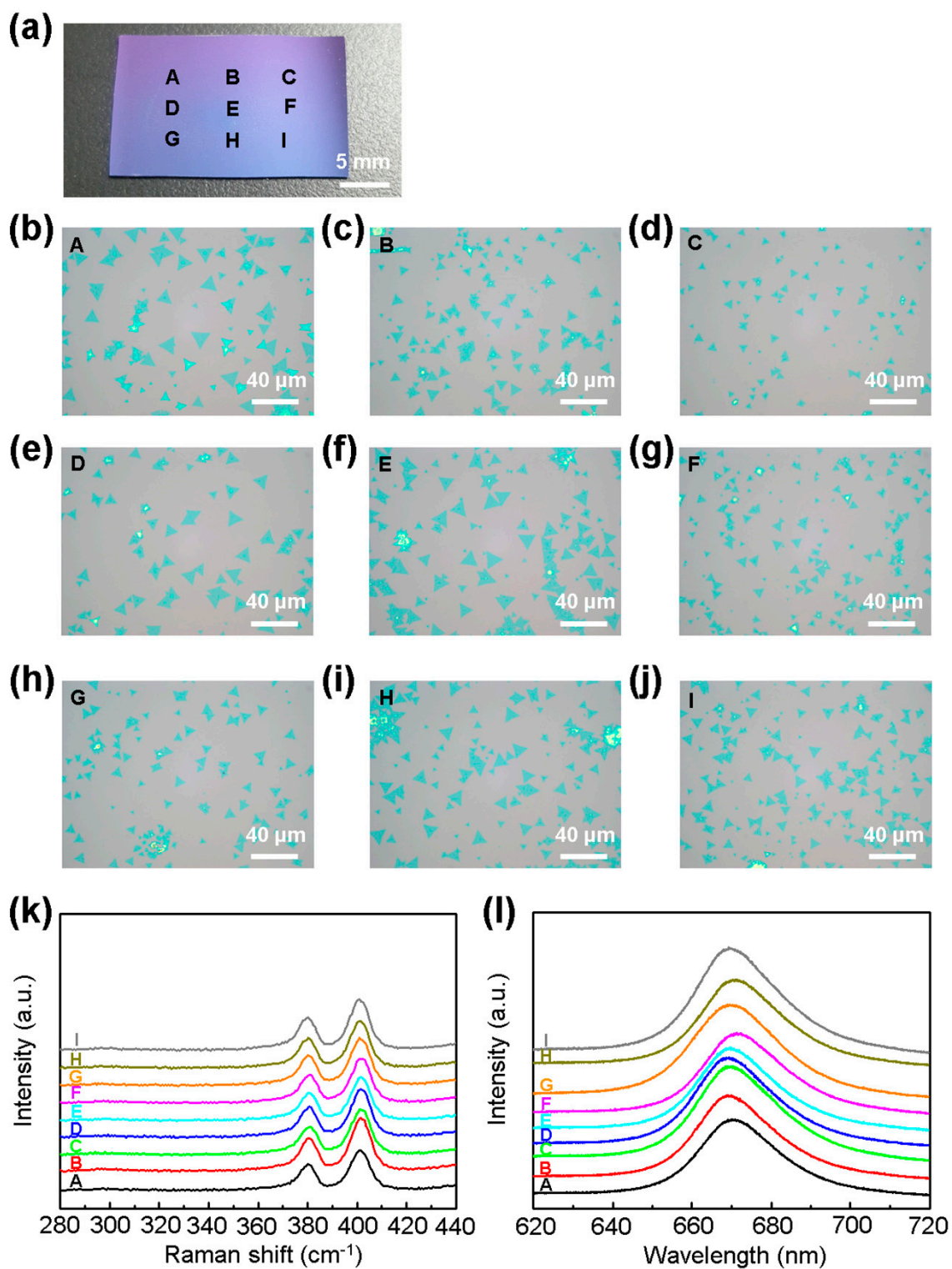
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**Figure S1.** Additional optical characterization of the MoS<sub>2</sub> grown using the conventional CVD method. (a) Optical image of thick MoS<sub>2</sub> films and monolayer MoS<sub>2</sub> synthesized on a SiO<sub>2</sub>/Si substrate using the conventional CVD method. (b-j) Magnified optical images of the region A, B, C, D, E, F, G, H, and I in (a), respectively.

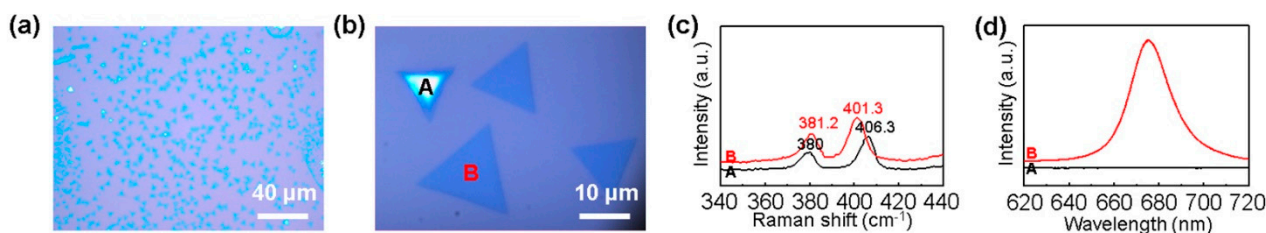


**Figure S2.** MoS<sub>2</sub> synthesized by the CVD method using H<sub>2</sub> as a carrier gas with Ar. (a) Optical image of the sample. (b) Magnified optical image of the region A of (a). (c) Magnified optical image of the dotted red rectangle in (b). (d) Raman spectrum and (e) PL spectrum of monolayer MoS<sub>2</sub> synthesized partially at the edge of the thick MoS<sub>2</sub> films.

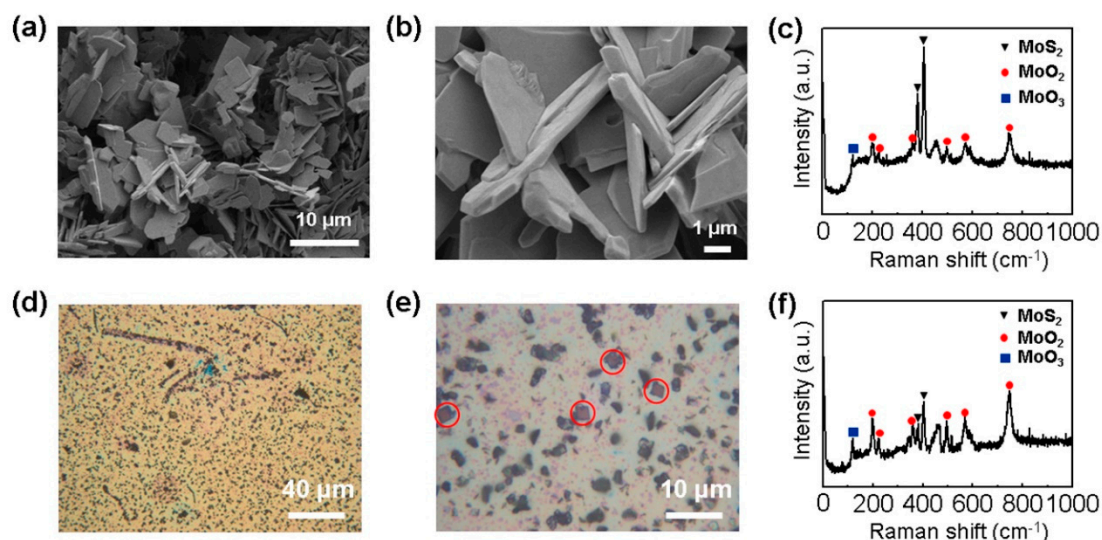


**Figure S3.** Additional optical characterization of the MoS<sub>2</sub> grown using the carbon cloth-assisted CVD method. (a) Optical image of monolayer MoS<sub>2</sub> synthesized on a SiO<sub>2</sub>/Si substrate using the carbon cloth-assisted CVD method. (b-j) Magnified optical images of the region A, B, C, D, E, F, G, H, and I in (a), respectively. (k) Raman and (l) PL spectra of monolayer MoS<sub>2</sub> synthesized in the region A, B, C, D, E, F, G, H, and I in (a).

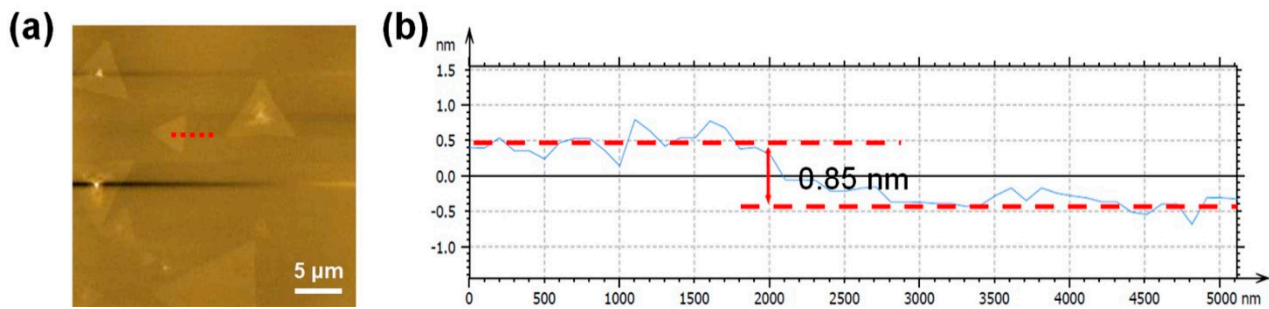




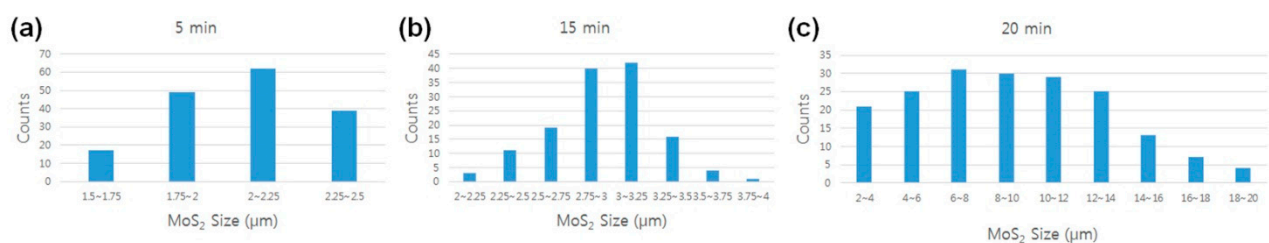
**Figure S4.** MoS<sub>2</sub> flakes grown using the carbon cloth-assisted CVD growth. (a) Low-magnification optical image of MoS<sub>2</sub> flakes. (b) High-magnification optical image of MoS<sub>2</sub> flakes. (c) Raman spectra taken at the point A and B of (b), respectively. (d) PL spectra taken at the point A and B of (b), respectively. These results show that the carbon cloth-assisted CVD growth produces mainly monolayer MoS<sub>2</sub> over a large area on the substrate and forms partially some MoS<sub>2</sub> multilayer. We believe that the partial formation of some MoS<sub>2</sub> multilayers is due to the local variation of experimental conditions on the substrate.



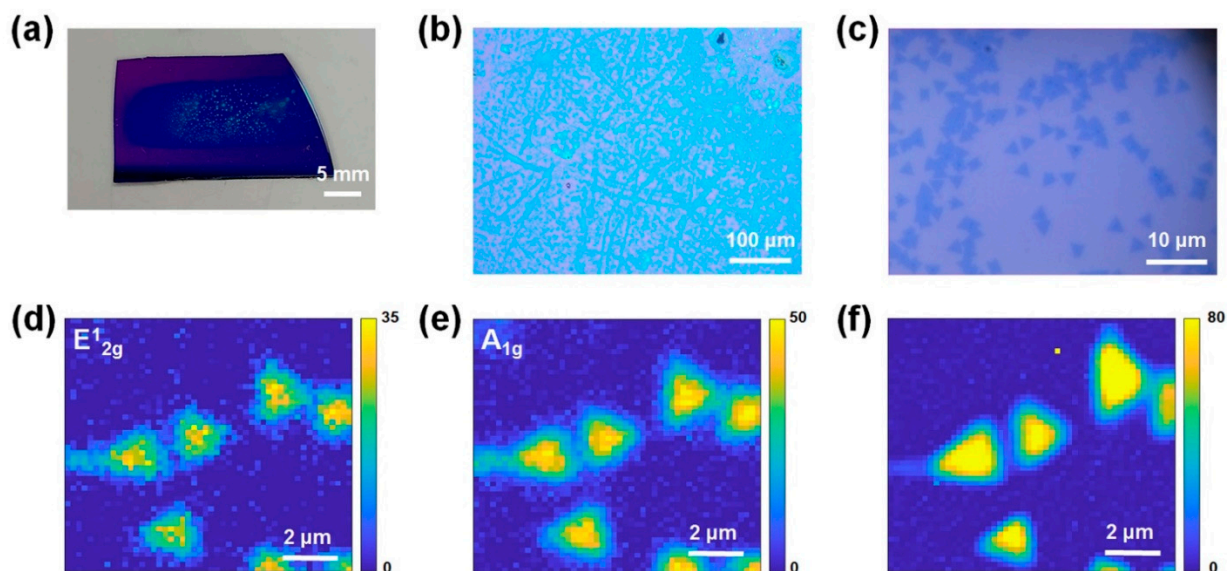
**Figure S5.** MoO<sub>2</sub>-MoS<sub>2</sub> nanoplates grown after the carbon cloth-assisted CVD growth and after the conventional CVD growth. (a,b) Low-magnification and high-magnification SEM images of MoO<sub>2</sub>-MoS<sub>2</sub> nanoplates grown on carbon cloth after the carbon cloth-assisted CVD growth. (c) Raman spectrum of MoO<sub>2</sub>-MoS<sub>2</sub> nanoplates grown on the carbon cloth. (d,e) Low-magnification and high-magnification optical images of MoO<sub>2</sub>-MoS<sub>2</sub> nanoplates (indicated by red circles) grown on a SiO<sub>2</sub>/Si substrate after the conventional CVD growth. (f) Raman spectrum of MoO<sub>2</sub>-MoS<sub>2</sub> nanoplates grown on the SiO<sub>2</sub>/Si substrate. MoO<sub>2</sub>-MoS<sub>2</sub> nanoplates were grown on carbon cloth instead of the SiO<sub>2</sub>/Si substrate when the carbon cloth is used, whereas MoO<sub>2</sub>-MoS<sub>2</sub> nanoplates were grown on the SiO<sub>2</sub>/Si substrate when no carbon cloth is used.



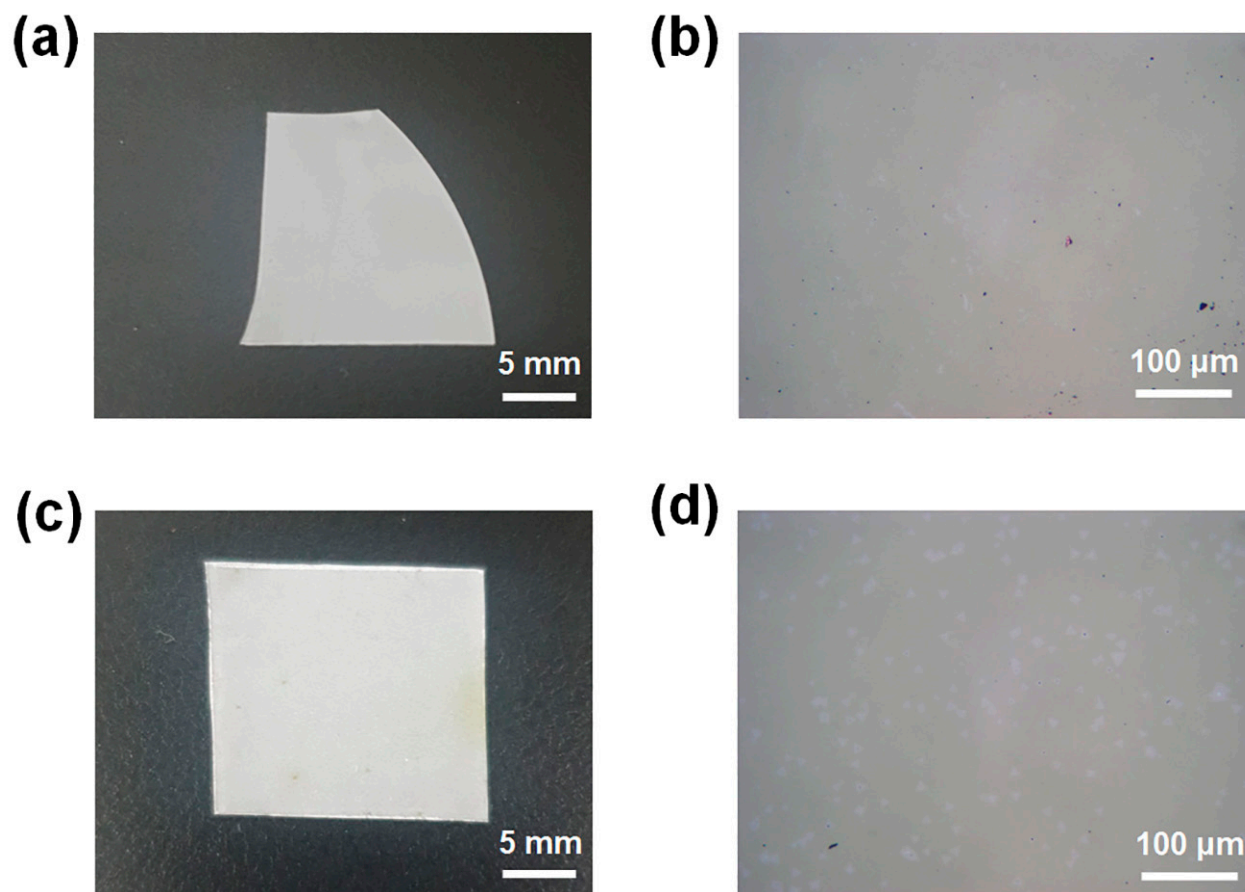
**Figure S6.** Additional AFM data of monolayer MoS<sub>2</sub> synthesized using the carbon cloth-assisted CVD method. (a) AFM height image of monolayer MoS<sub>2</sub>. (b) Height line profiles along the dotted red line in (a).



**Figure S7.** Size distribution of monolayer MoS<sub>2</sub> synthesized at reaction times of 5 min, 15 min, and 20 min using the carbon cloth-assisted CVD method, respectively.



**Figure S8.** Graphite powder-assisted CVD growth of monolayer MoS<sub>2</sub>. (a) Optical image of the sample. (b) Low-magnification and (c) high-magnification optical images of the monolayer MoS<sub>2</sub>. (d,e) Raman maps of the E<sub>2g</sub> mode and A<sub>1g</sub> mode of MoS<sub>2</sub>, respectively. (f) PL map of monolayer MoS<sub>2</sub>.



**Figure S9.** Monolayer WS<sub>2</sub> synthesized on a c-cut sapphire substrate using the conventional CVD method and the carbon cloth-assisted CVD method. (a) Optical image and (b) magnified optical image of the WS<sub>2</sub> synthesized on a c-cut sapphire substrate using the conventional CVD method. (c) Optical image and (d) magnified optical image of the WS<sub>2</sub> synthesized on a c-cut sapphire substrate using the carbon cloth-assisted CVD method.