Electronic Supplementary Material (ESI) for Nanoscale.

Photoluminescence nonuniformity from self-seeding nuclei in CVD grown monolayer $MoSe_2$

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Supporting Information

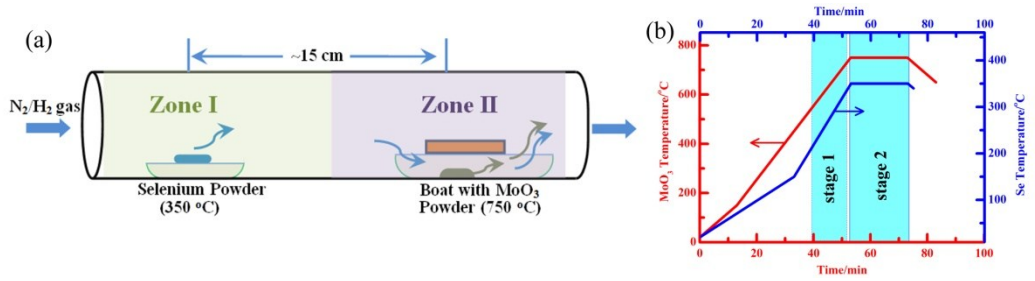

Fig. S1. Schematic showing the growth detail. (a) The ceramic boat containing Se powder (500 ~mg) was placed at the upstream about 15 cm from the MoO_3 powder (~20 mg). The distance between the MoO_3 powder and the SiO_2/Si substrate is about 0.5 cm. In a typical run, the growth substrates cleaned by aceton and isopropanol (IPA). 20 min growth later, the chamber was nature cooled down to room temperature. The flow rate was kept to be 100 s.c.c.m. to sever as carrier gas and reducing environment. (b) The rise temperature curves for Se powder and MoO_3 powder. The growth temperatures are, respectively, ~350 °C for Se powder, and ~750 °C for MoO_3 powder.

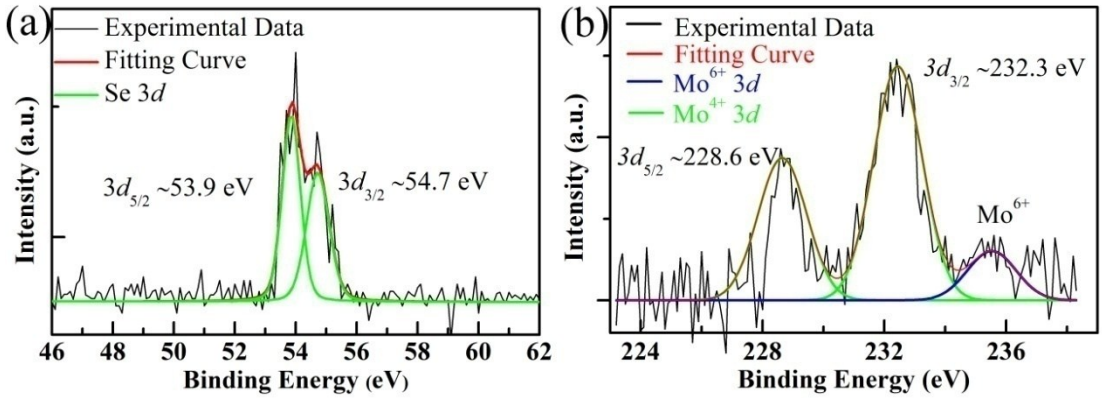

Fig. S2. XPS spectra showing the binding energy Se (a) and Mo (b). The small hump about Mo^{6+} indicates existence of trace amount of oxygen.

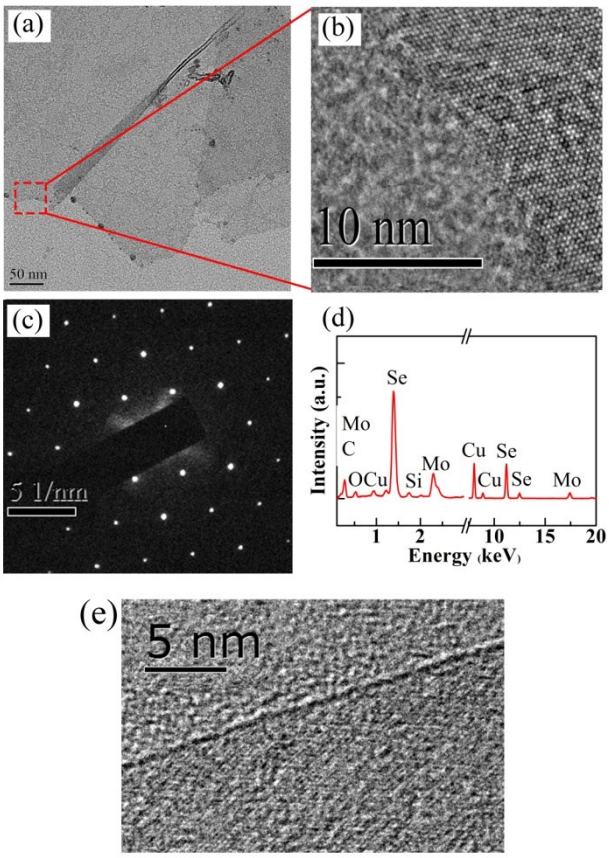

Fig. S3. TEM image of the crystal. (a) Low magnification TEM image of $MoSe_2$ crystal. (b) High resolution TEM. (c) Hexagonal SAED pattern of the crystal. (d)EDX. (e) High resolution TEM of the edge.

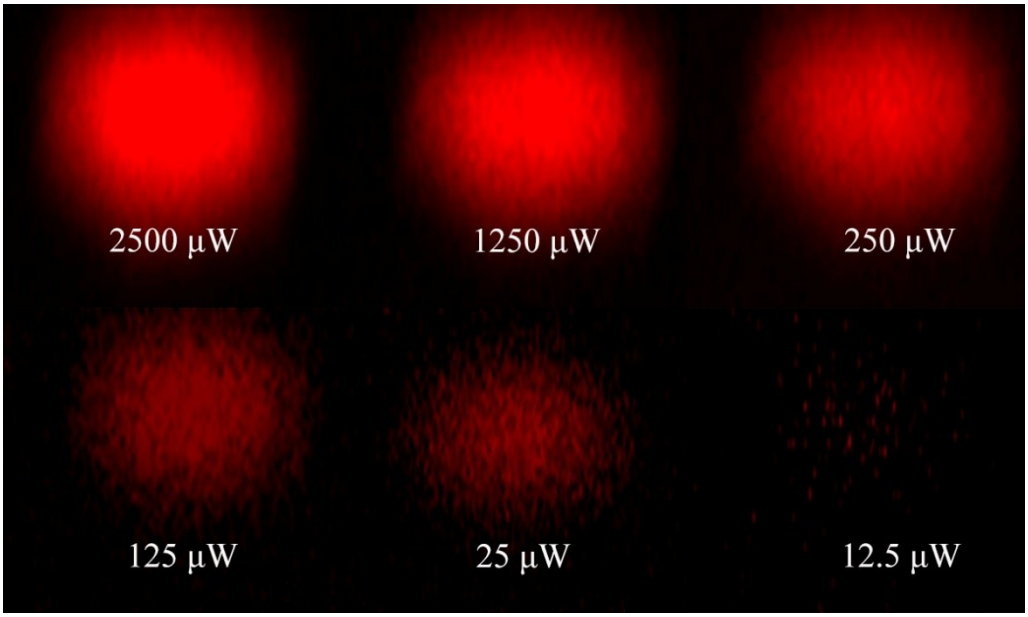

Fig. S4. PL intensity maps of $MoSe_2$ monolayers obtained with different excitation laser power levels.

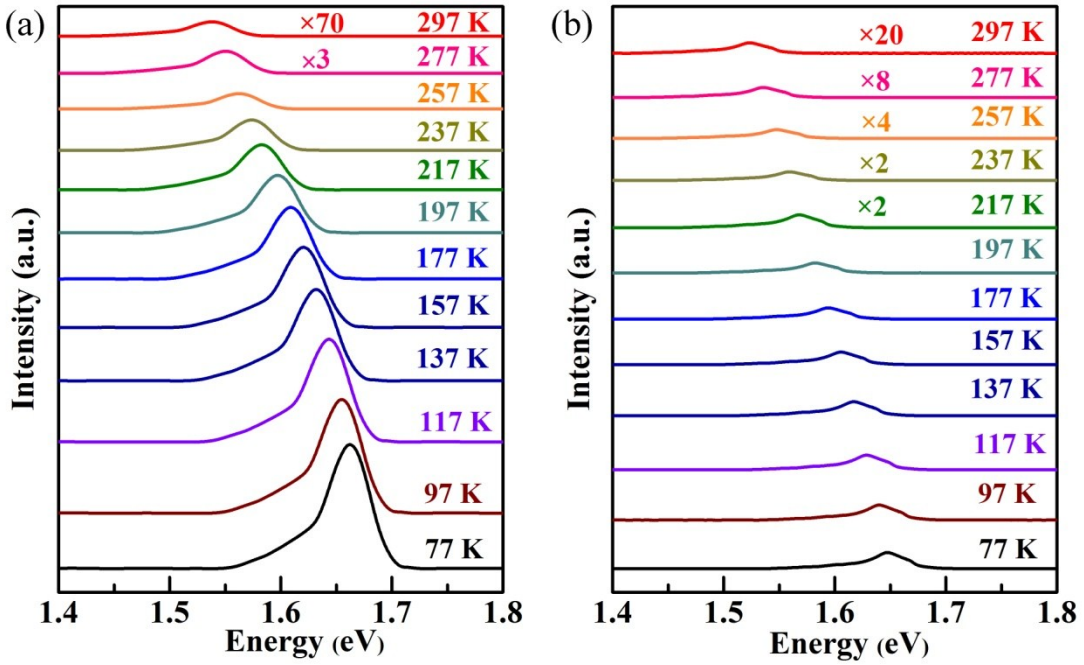

Fig. S5. PL spectra for $MoSe_2$ monolayer collected from the inner region (position C in Fig. 2) and the edge region (position A in Fig. 2) at different temperatures between 297 K and 77 K.

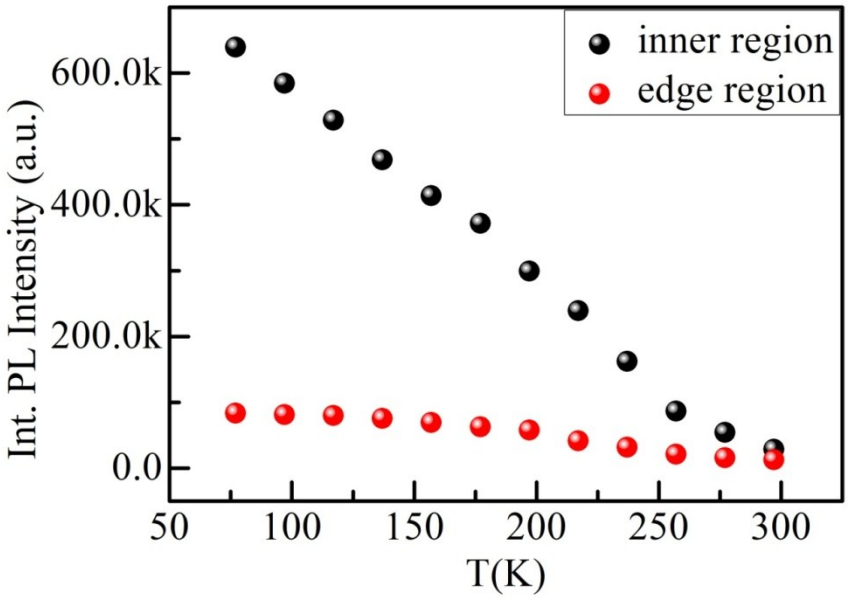

Fig. S6.The integrated PL intensity as a function of temperature at the inner region and the edge region.