Does an intrinsic strain contribute to the effect of quantum confinement phenomenon? An alloyed transition metal dichalcogenide series, $Mo(S_{1-x}Se_x)_2$ as a case study

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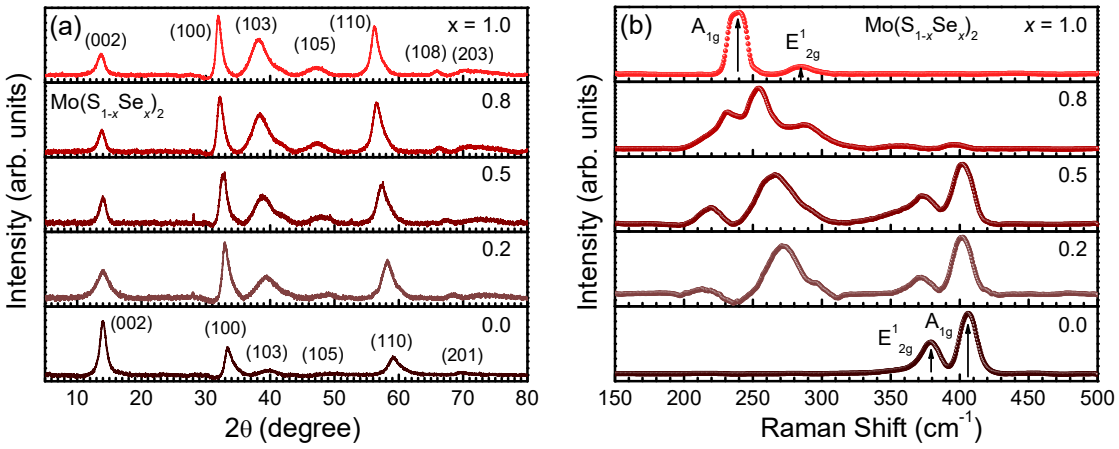

Fig. S1 (a) XRD patterns and (b) Raman spectra of $Mo(S_{1-x}Se_x)_2$ alloyed-TMDs for different contents of selenium.

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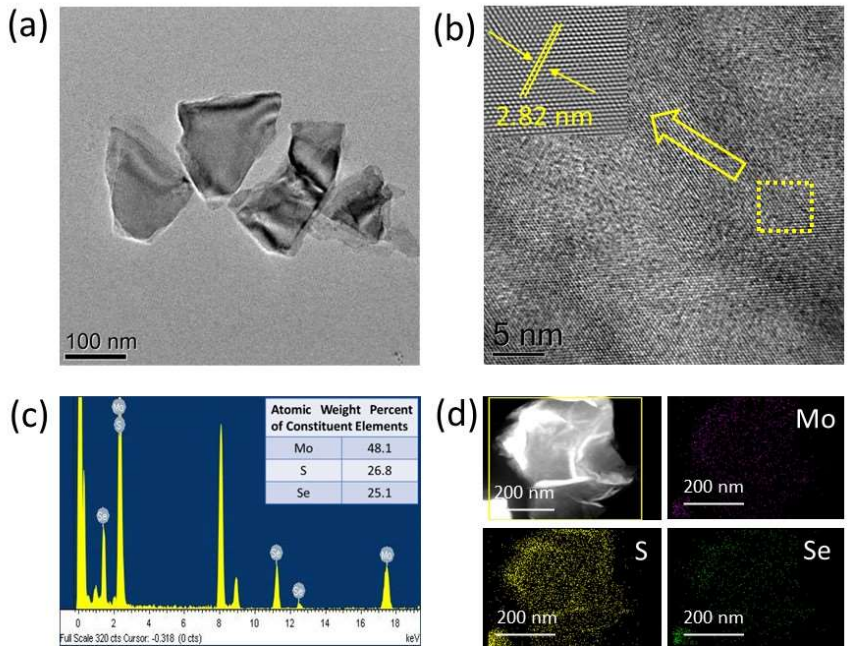

Fig. S2 (a) TEM and (b) HR-TEM micrographs and (c) corresponding EDX spectra of $Mo(S_{0.5}Se_{0.5})_2$ nanoflakes. (d) The elemental mapping of the compound in a nanoflake.

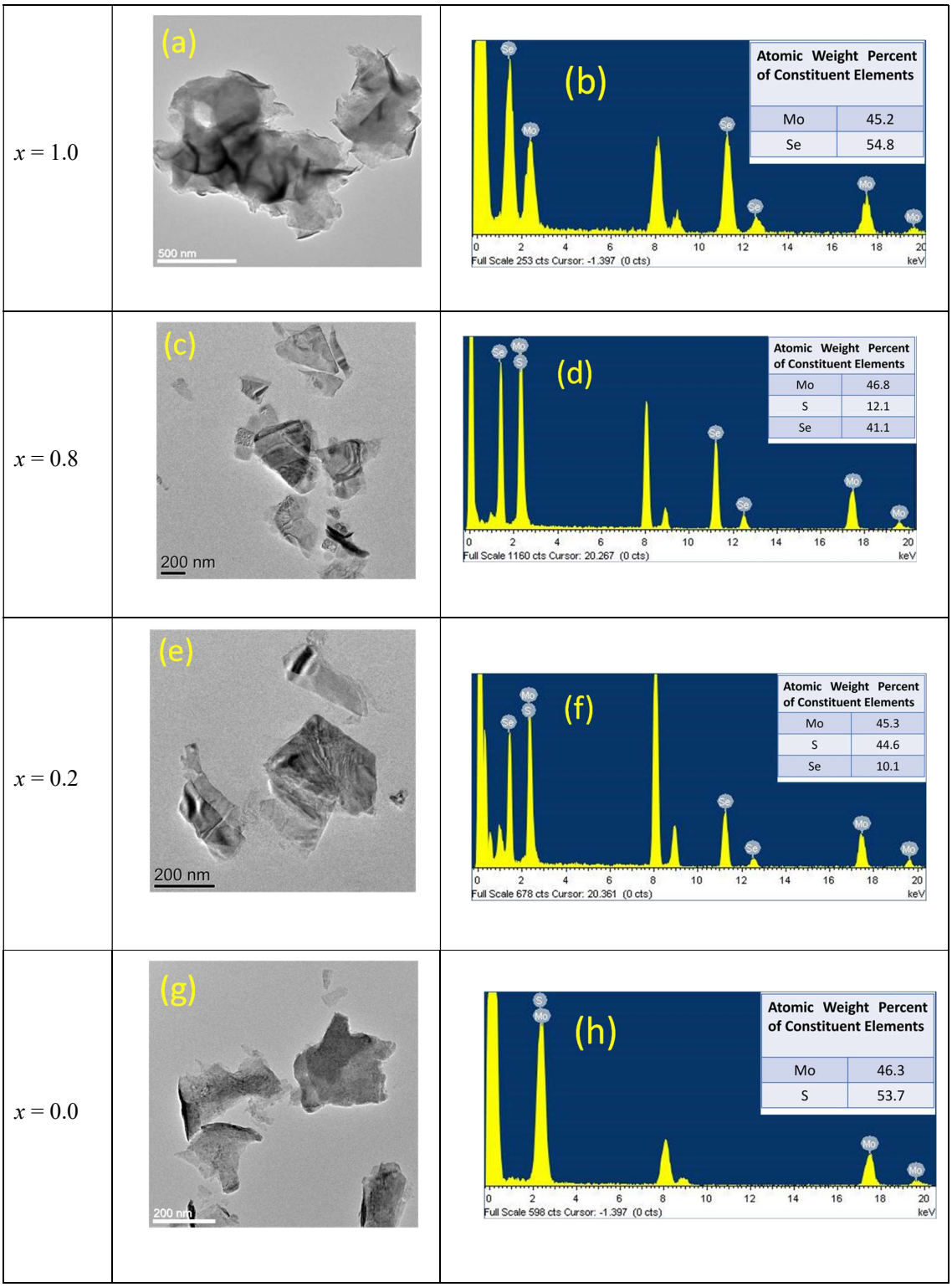

Fig. S3 TEM images and EDX spectra of $Mo(S_{1-x}Se_x)_2$ nanosheets showing the atomic percentages of the constituent elements.

Table S1. The targeted elemental composition used during the hydrothermal synthesis method vis-à-vis the results obtained from the EDX analyses of the TMD alloys.

x in the Targeted TMD $Mo(S_{1-x}Se_x)_2$	Atomic Percentage		
	Molybdenum	Sulfur	Selenium
0.2	45.3	44.6	10.1
0.5	48.1	26.8	25.1
0.8	46.8	12.1	41.1

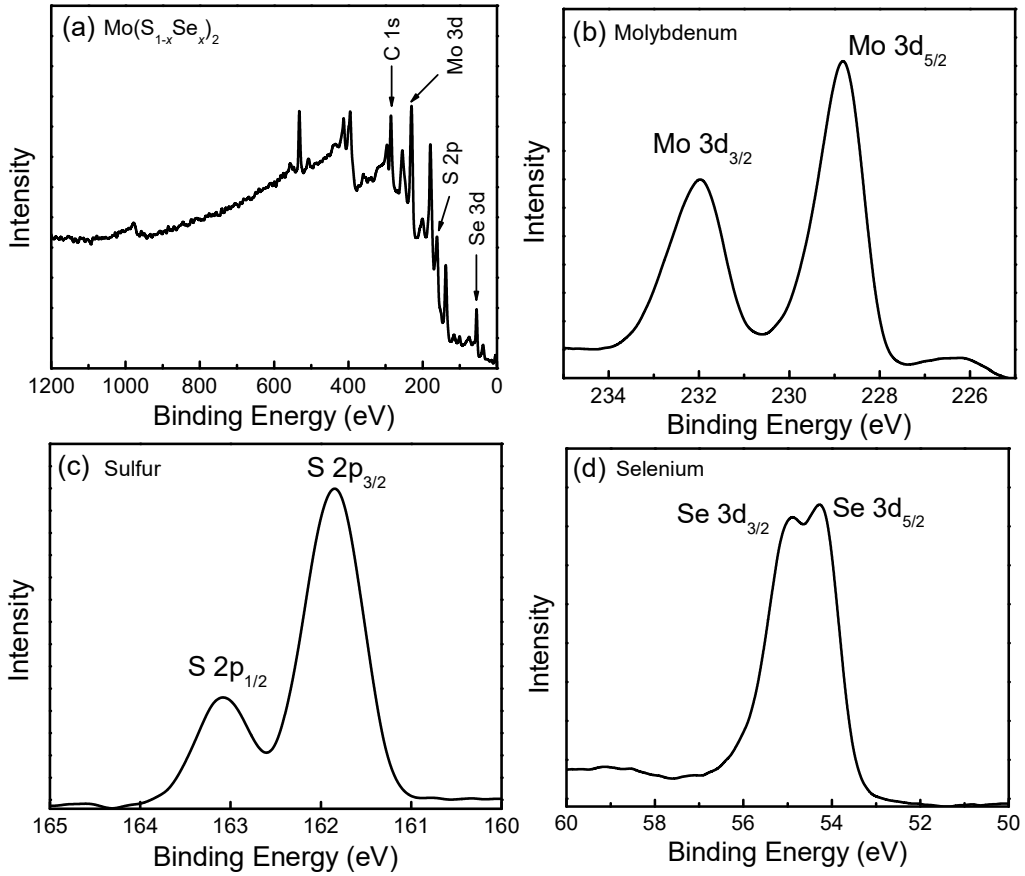

Fig. S4 (a) Full range XPS spectrum of $Mo(S_{1-x}Se_x)_2$ (with selenium content, x = 0.5) and the high-resolution spectra of (b) Mo 3d, (c) S 2p, and (d) Se 3d states.

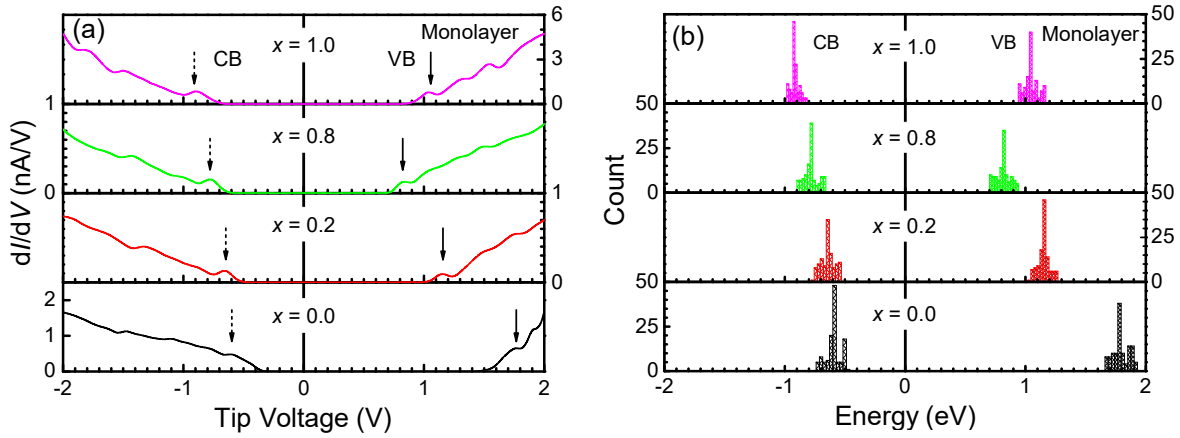

Fig. S5 (a) dI/dV spectra and (b) histogram of the CB and the VB energies with respect to Fermi level (E_F) for a monolayer of different alloyed-TMDs.

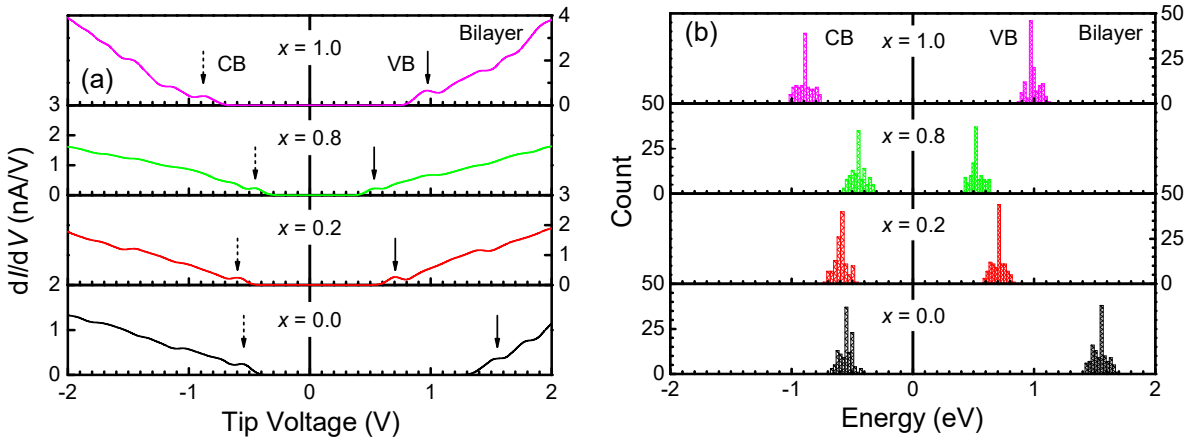

Fig. S6 (a) dI/dV spectra and (b) histogram of the CB and the VB energies with respect to Fermi level (E_F) for a bilayer of different alloyed-TMDs.

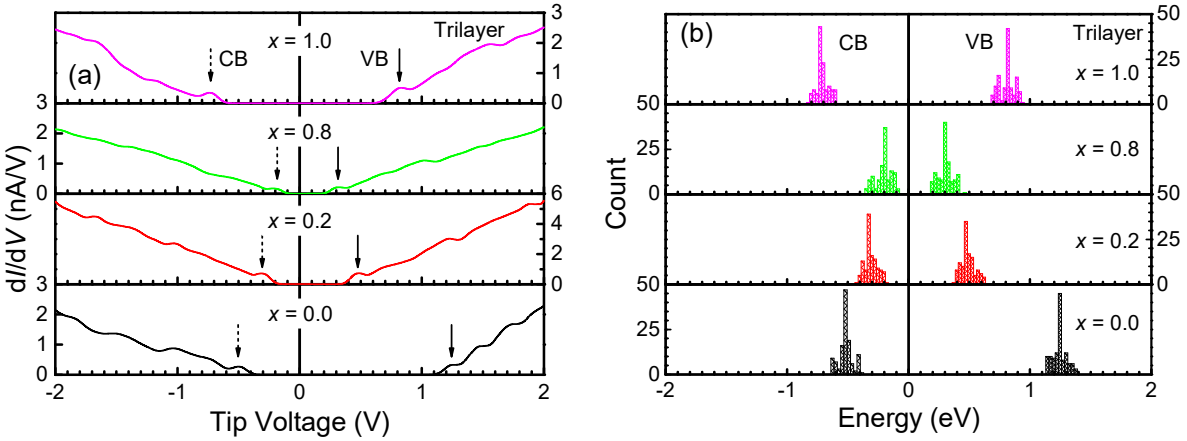

Fig. S7 (a) dI/dV spectra and (b) histogram of the CB and the VB energies with respect to Fermi level (E_F) for a trilayer of different alloyed-TMDs.

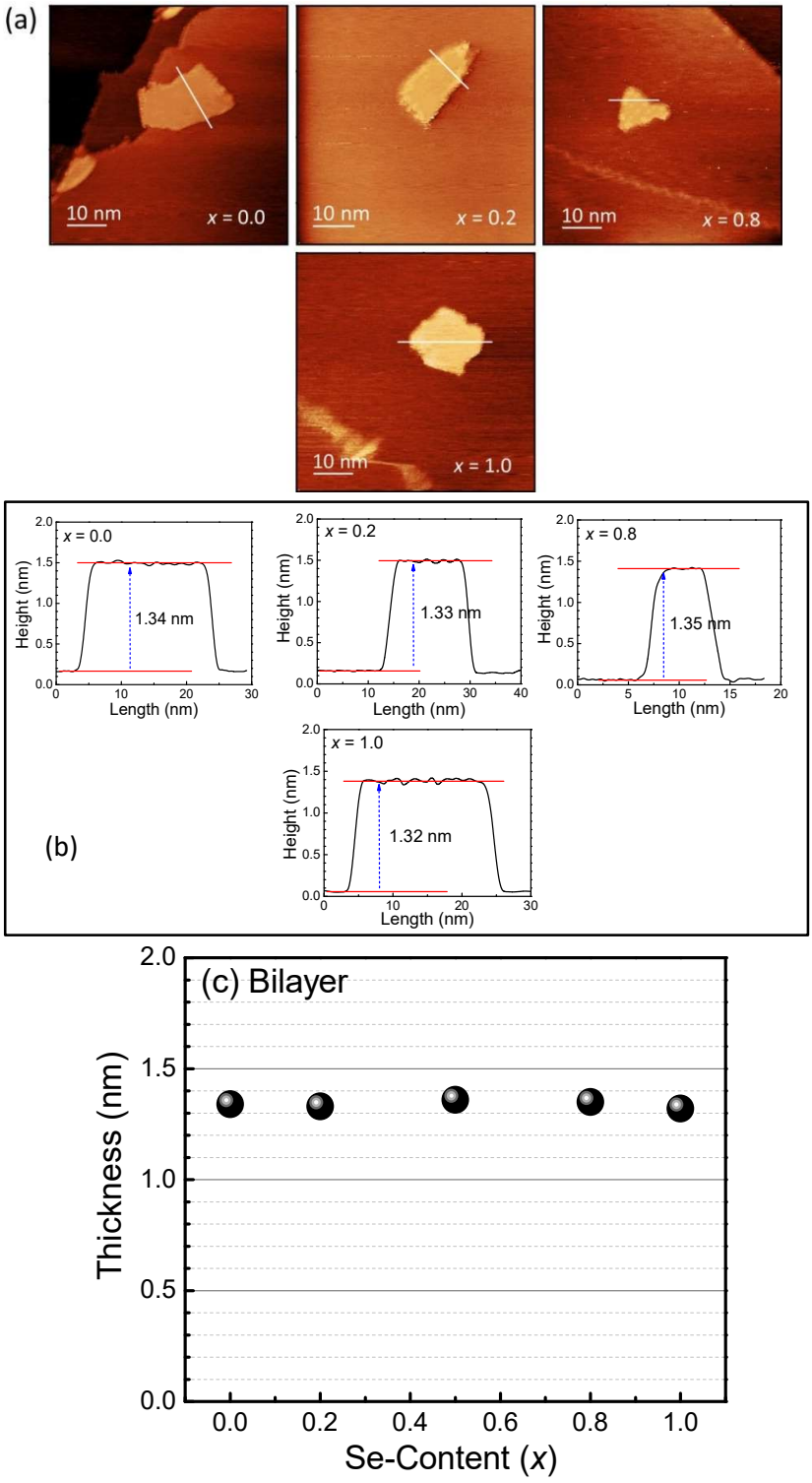

Fig. S8 (a) STM topographies and (b) the line profiles on the topographies of $Mo(S_{1-x}Se_x)_2$ in their bilayer-form. (c) Thickness of a bilayer as a function of the selenium content in the alloyed-TMDs.

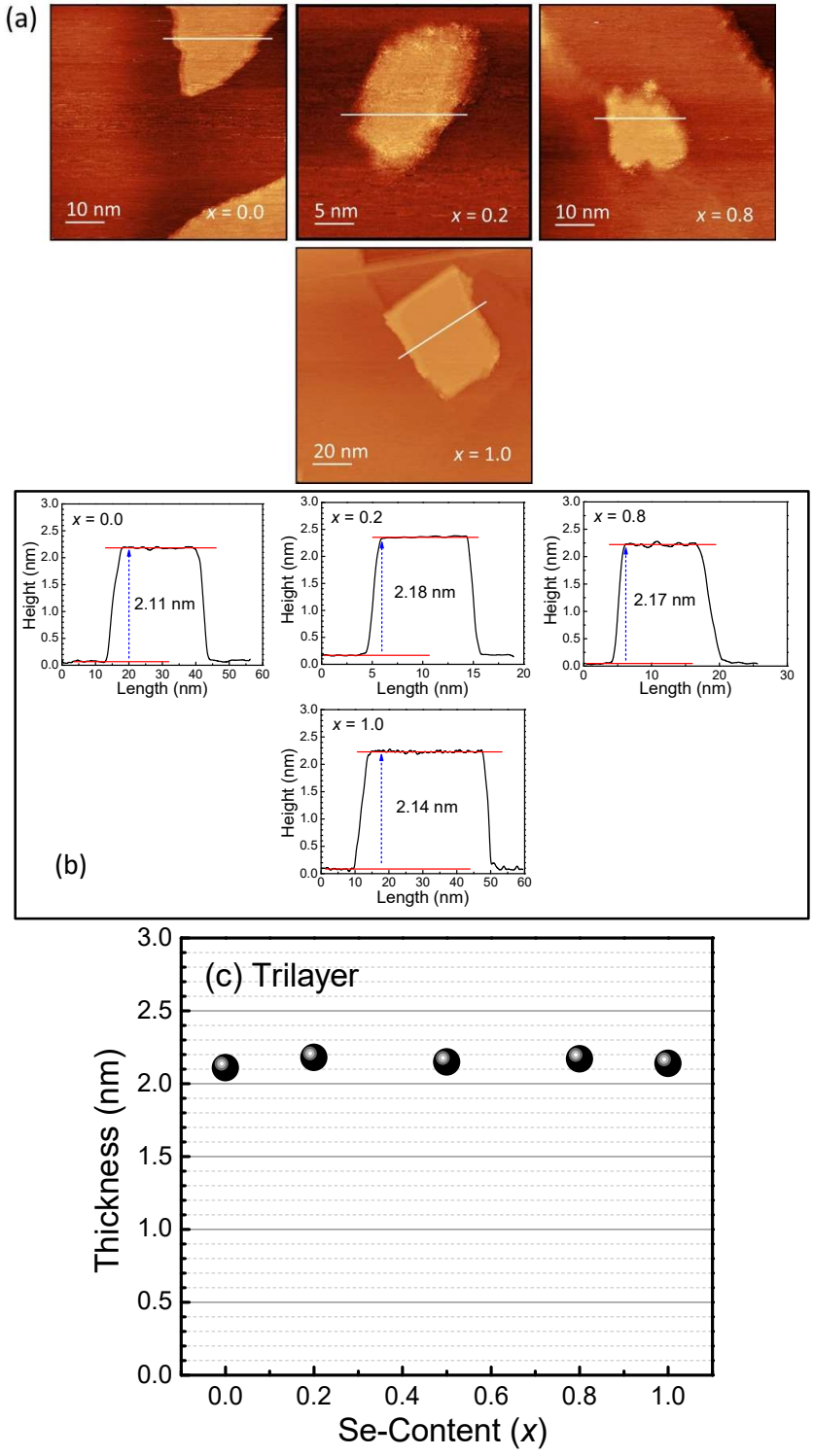

Fig. S9 (a) STM topographies and (b) the line profiles on the topographies of $Mo(S_{1-x}Se_x)_2$ in their trilayer-form. (c) Thickness of a trilayer as a function of the selenium content in the alloyed-TMDs.