Supporting Information

Enhanced exciton emission behaviors and tunable band gap of ternary W(S\textsubscript{x}Se\textsubscript{1−x})\textsubscript{2} monolayer: Temperature dependent optical evidence and first-principles calculations

Huimin Sun,\textsuperscript{a} Junyong Wang,\textsuperscript{a} Fang Wang,\textsuperscript{a} Liping Xu,\textsuperscript{a} Kai Jiang,\textsuperscript{a} Liyan Shang,\textsuperscript{a} Zhigao Hu,\textsuperscript{a,*}\textsuperscript{a,b} and Junhao Chu\textsuperscript{a}

\textsuperscript{a} Key Laboratory of Polar Materials and Devices (MOE) and Technical Center for Multifunctional Magneto-Optical Spectroscopy (Shanghai), Department of Electronic Engineering, East China Normal University, Shanghai 200241, China

\textsuperscript{b} Collaborative Innovation Center of Extreme Optics, Shanxi University, Taiyuan, Shanxi 030006, China

\*Author to whom correspondence should be addressed. Tel.: +86-21-54345150. Fax: +86-21-54345119.

Electronic mail: zghu@ee.ecnu.edu.cn (Dated: Wednesday 25\textsuperscript{th} April, 2018)
Fig. S 1: Schematic illustration of the CVD growth for W(S_xSe_{1-x})_2 alloy nanosheets.
Fig. S 2: Raman spectra as a function of temperature for a chemical vapor deposited single layer (a) WS$_2$, and (b) WSe$_2$, respectively.
Fig. S3: Phonon frequency of five main vibrational modes as a function of temperature for monolayer W(S\textsubscript{0.5}Se\textsubscript{0.5})\textsubscript{2} nanosheets.
Fig. S4: Phonon frequency of five main vibrational modes as a function of temperature for monolayer $W(S_{0.3}Se_{0.7})_2$ nanosheets.
Fig. S 5: The PL intensities of the exciton (X) and trion (T) emissions as a function of temperature for monolayer alloy nanosheets: (a) WS$_2$, (b) W(S$_{0.7}$Se$_{0.3}$)$_2$, (c) W(S$_{0.5}$Se$_{0.5}$)$_2$, (d) W(S$_{0.3}$Se$_{0.7}$)$_2$ and (e) WSe$_2$, respectively.