Supporting Information

COMMUNICATION

A facile synthetic route to tungsten diselenide using a new precursor containing a long alkyl chain cation for multifunctional electronic and optoelectronic applications

Received 00th January 20xx,
Accepted 00th January 20xx

DOI: 10.1039/x0xx00000x

www.rsc.org/

Jahee Kim,[‡ab] Yi Rang Lim,[‡ac] Yeoheung Yoon,[a] Wooseok Song,[a] Bo Keun Park,[ab] Jongsun Lim,*[a] Taek-Mo Chung,*[ab] and Chang Gyoun Kim*[ab]

[a.] *Thin Film Materials Research Center, Korea Research Institute of Chemical Technology, Daejeon 305-600, Republic of Korea, E-mail: jslim@krict.re.kr*
[b.] *Department of Advanced Materials and Chemical Engineering, University of Science and Technology (UST), 217 Gajeong-ro, Yuseong-gu, Daejeon 34113, Republic of Korea*
[c.] *School of Electrical and Electronic Engineering, Yonsei University, 50 Yonsei-ro, Seodaemun-gu, Seoul 03722, Republic of Korea*

TG-DTA-Mass spectroscopy using TG-DTA/Photoionization-Mass Spectrometer System was measured at Kangwon National University (Samchok) and monitored mainly by the photoionization mode (PI) of the mass spectrometer having the weak energy intensity (10.2 eV). The reference mass spectra of NIST measured by an electron impactionization (EI) method (70 eV) were adopted to compare major peaks of the products obtained in this work.

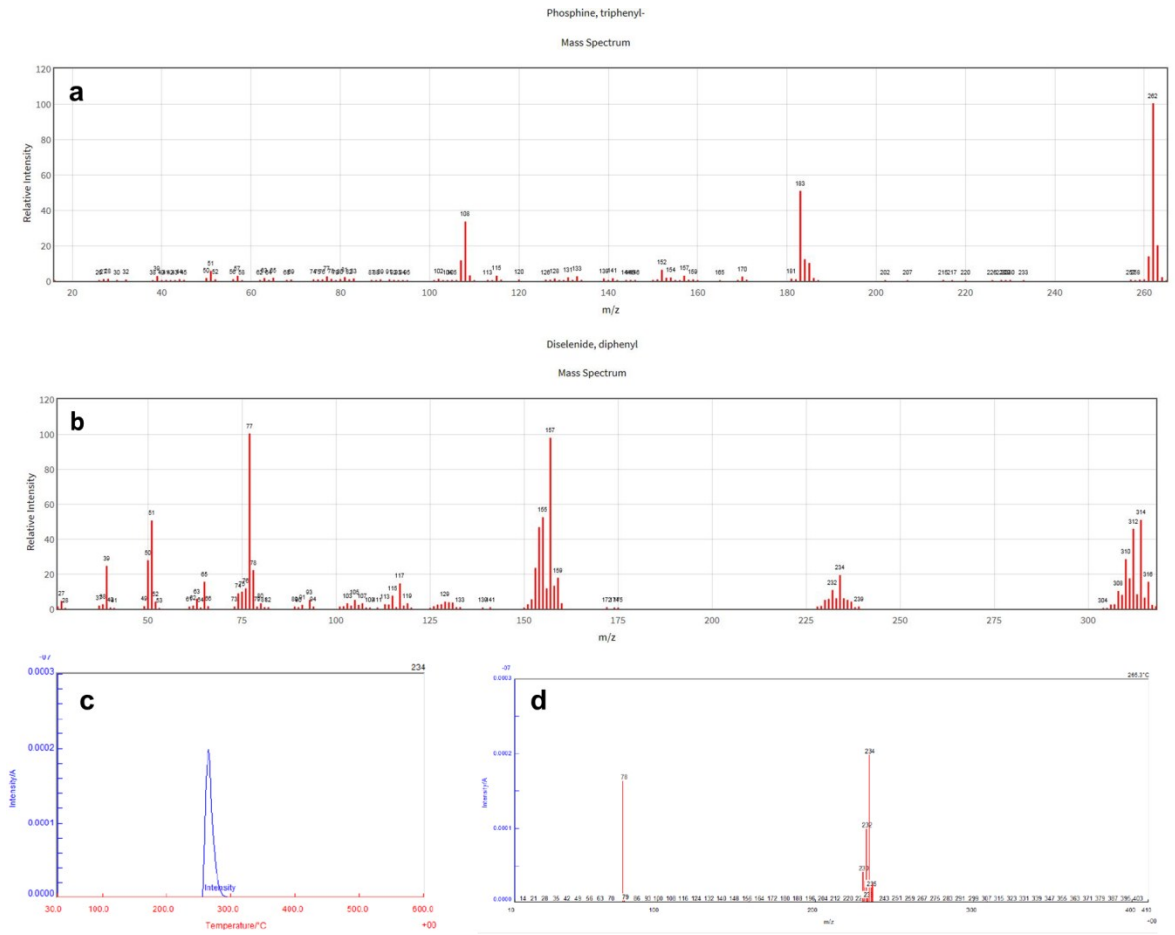

Fig. S1 Mass spectra of $(Ph_4P)_2[WSe_4]$ measured by TG-DTA-Mass. (a) Referred mass spectrum of triphenyl phosphine. (b) Referred mass spectrum of diphenyl diselenide. (c) Graph of mass intensity with temperature change. The peak appeared at 260.4 to 270.6 °C when decomposed in TG-DTA. (d) Mass peaks at the decomposition temperature.

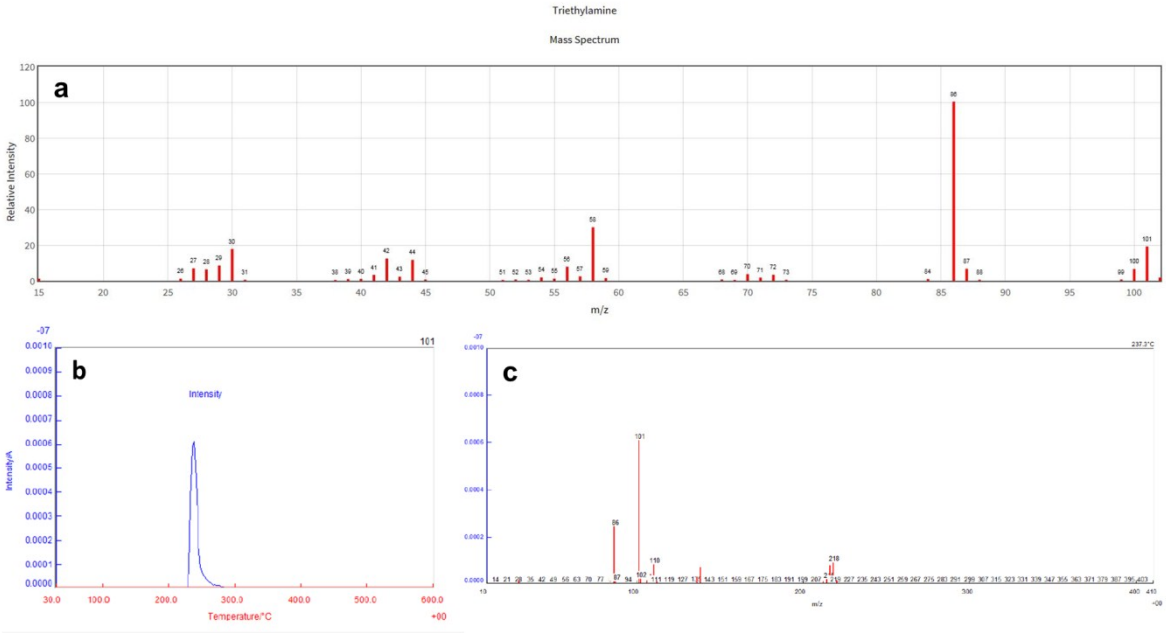

Fig. S2 Mass spectra of $(Et_4N)_2[WSe_4]$ measured by TG-DTA-Mass. (a) Referred mass spectrum of triethylamine. (b) Graph of mass intensity with temperature change. The peak appeared at 234.8 to 239.5 °C when decomposed in TG-DTA. (c) Mass peaks at the decomposition temperature.

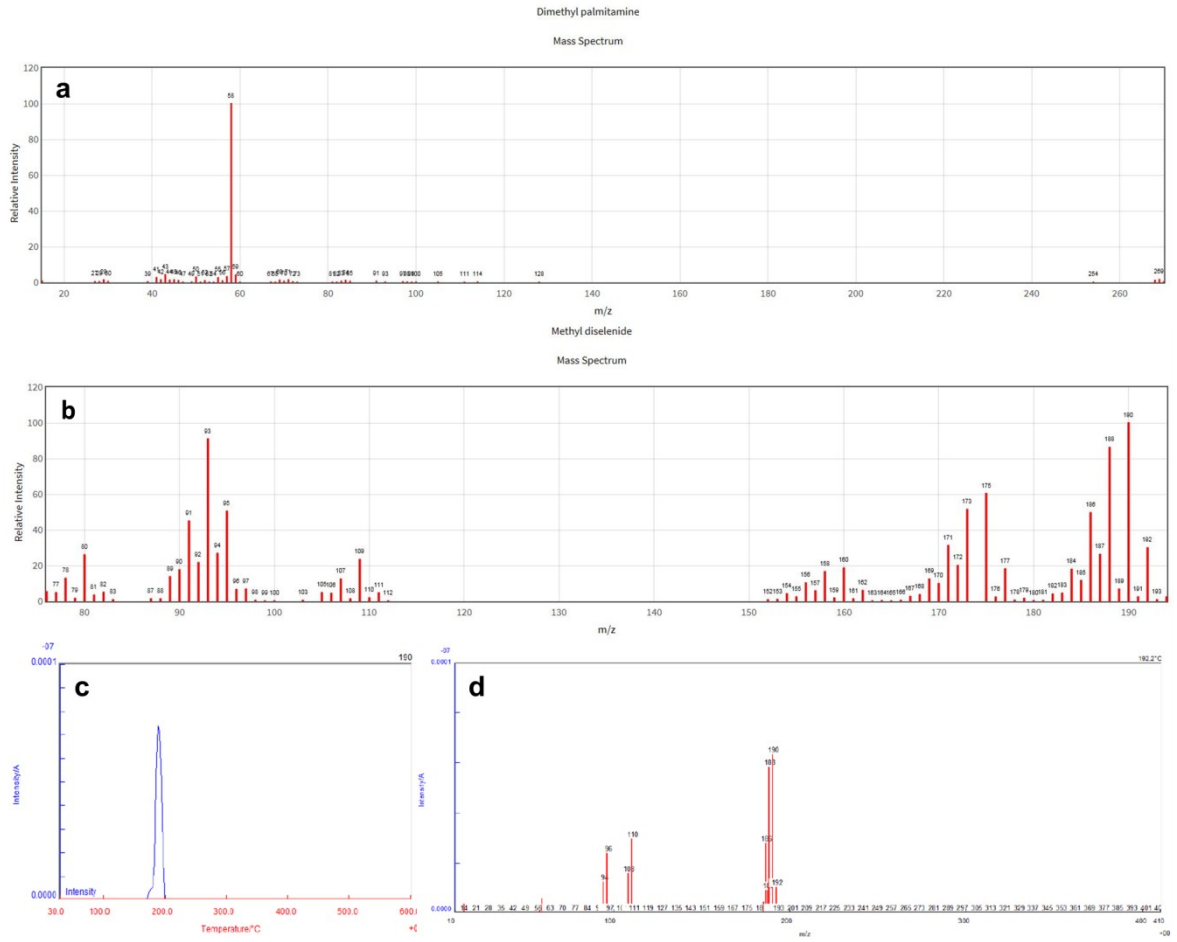

Fig. S3 Mass spectra of $(CTA)_2[WSe_4]$ measured by TG-DTA-Mass. (a) Referred mass spectrum of dimethyl palmitamine (cetyl dimethyl amine). (b) Referred mass spectrum of dimethyl diselenide. (c) Graph of mass intensity with temperature change. The peak appeared at 183.8 to 196.0 ^{o}C when decomposed in TG-DTA. (d) Mass peak at the decomposition temperature.

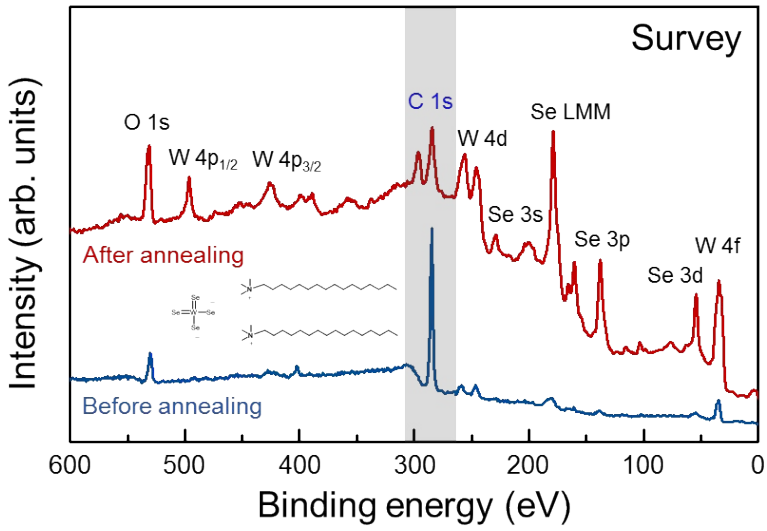

Fig. S4 XPS survey spectra for $(CTA)_2[WSe_4]$ coated on SiO_2 (300 nm)/Si(001) before and after annealing for the synthesis of WSe_2 layers.

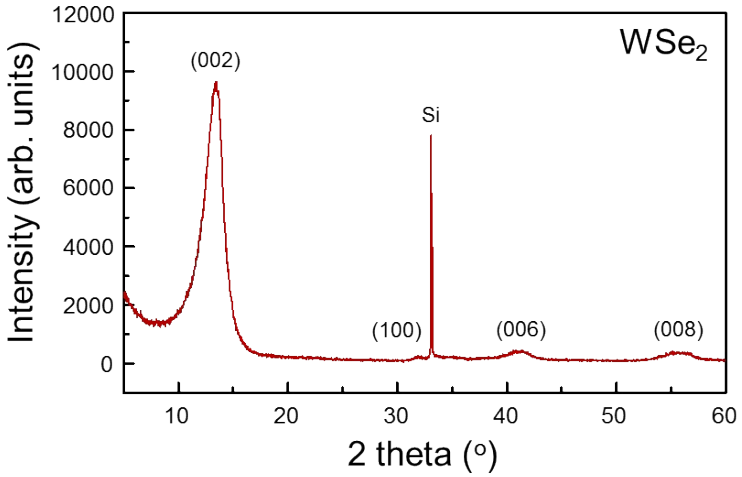

Fig. S5 In-plane XRD pattern of the WSe_2 crystal grown onto a SiO_2/Si substrate using a newly developed single source precursor.