SUPPORTING INFORMATION

$(H_2NC_4H_8NCH_2CH_2NH_2)_2Zn_2Sn_2Se_7$: A Hybrid Ternary Semiconductor Stabilized by Amine Molecules Acting Simultaneously as Ligands and Counterions

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Powder X-ray Diffraction (PXRD). The powder X-ray diffraction pattern of **1** was collected on a Rigaku D/MAX-2000H rotating anode diffractometer (CuKα radiation) equipped with a secondary pyrolytic graphite monochromator operated at 40 kV and 178 mA. The scan rate was 0.15 deg/min with a step size of 0.01 deg. The sample was ground and spread on an aluminium holder. The simulated PXRD pattern of **1** was calculated using Powder Cell 2.3 from the corresponding single crystal structure. A comparison between the experimental and the calculated PXRD is shown in Figure S1 below.

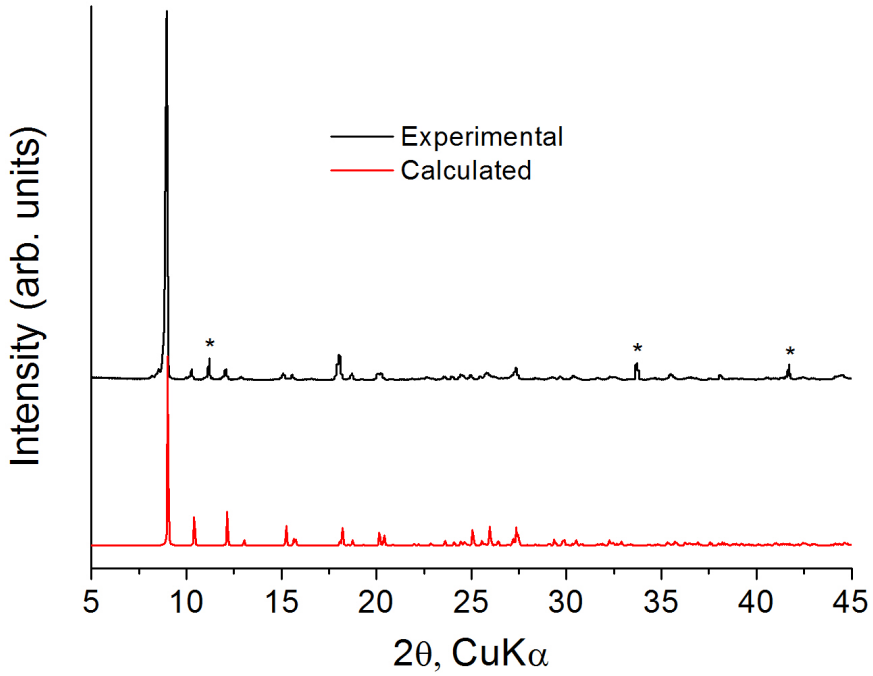

Figure S1. Experimental (black line) and calculated (red line) PXRD pattern for **1.** Asterisks indicate unidentified impurities.

Infrared spectroscopy. The ATR-IR spectrum of **1** was recorded on a Thermo-Electron Nicolet 6700 FT-IR optical spectrometer with a DTGS KBr. The spectrum is shown in Figure S3, were the characteristic absorption bands of $–NH_2^+$- and $–NH_2$ groups[1] are clearly observed.

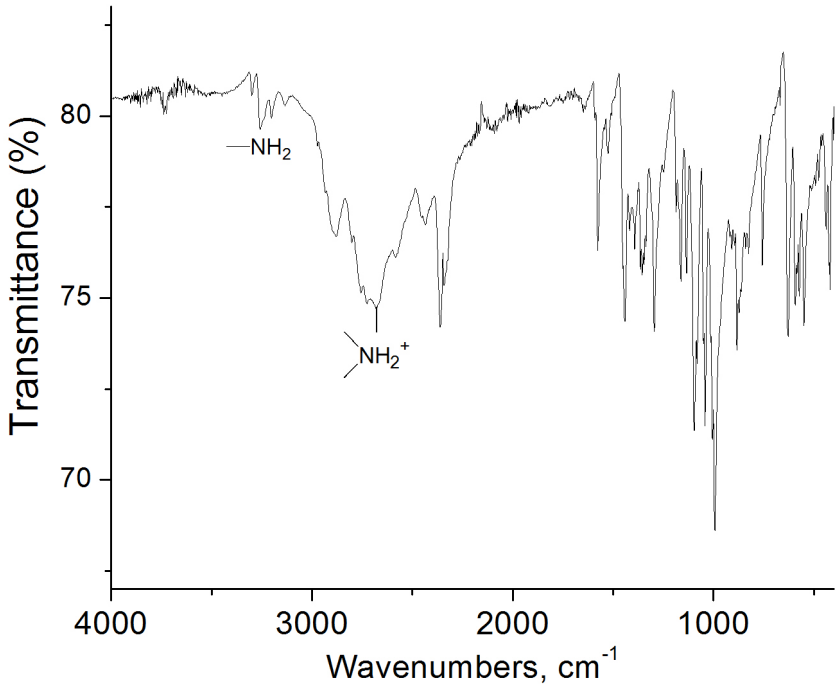

Figure S2. ATR-IR spectrum of **1**.

Thermogravimetric analysis (TGA) was performed using a TA SDT Q 600 analysis system. An amount of 20 mg of **1** was placed inside an alumina cup and heated up to 600 ^{o}C under Argon flow with a heating rate of 5 ^{o}C/min. The compound shows no appreciable weight loss up to 230 ^{o}C consistent with the fact that contains no solvent molecules. Between 230 and 390 ^{o}C, weight loss occurs due to the decomposition of the organic molecules. The observed weight loss (25%) correlates well with that calculated from the molecular formula of **1** assuming completely removal of the organic molecules (22%). The inorganic residue at 600 ^{o}C examined by PXRD was found to contain poorly crystalline ZnSe and $SnSe_2$.

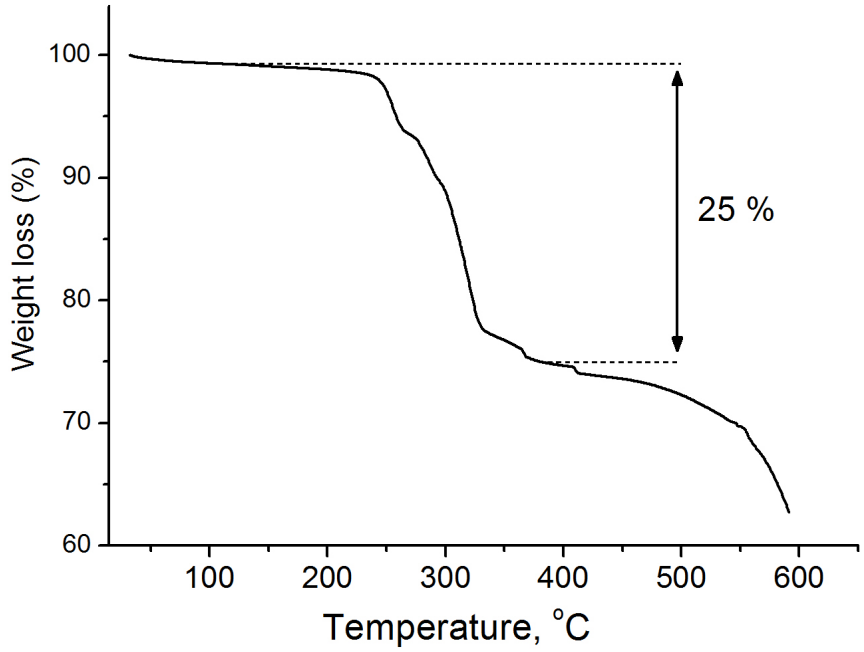

Figure S3. TGA curve of **1** under Argon flow.