Supplemental Materials:

The density, transmission spectra and volume fraction of the commercial and lab melt, following the same heat treatment protocol are illustrated in Figure 1, 2 and Table 1 respectively.

The density of the glass and glass-ceramic were measured using a method based on the Archimedes principle. The mass of sample in the air, the mass of sample submerged in deionized water, and the density of water at the measurement temperature were used to calculate the density of samples, according to Eq.1 with a precision of 0.0001. The relative uncertainty in the order of ± 0.4 %, over five measurements.

$$\rho_{sample} = \frac{\rho_{H_2O} m_{air}}{m_{air} - m_{H_2O}} \qquad \text{Eq. 1}$$

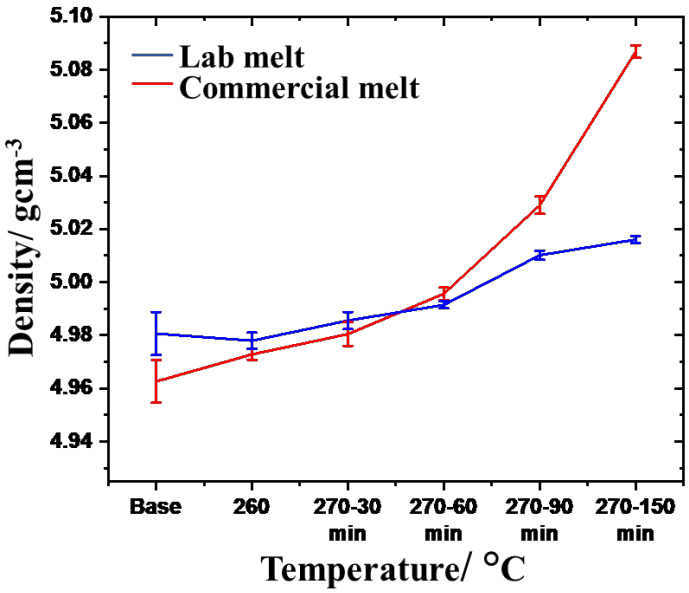

Figure 1 Illustrates the variation in density (gcm^{-3}) of commercial and lab melt, following identical heat-treatment protocol.

Optical transmission was measured on post heat-treated glass coupons to assess the role of crystallization on transparency. Transmission measurements were performed using a Thermo Fisher Scientific Nicolet iS5 Fourier Transform Infrared spectroscopy (FTIR), on base and heat-treated samples over a range of wavelengths from 2 µm to 25 µm. Samples were double-sided polished, with a thickness of ~ 2.5 mm. Each sample was repolished after heat treatment. The resolution of this system is between ± 1%. Sources of error during this measurement are due to defects associated with sample preparation, as poor surface quality and non-parallel sides reduce transmission.

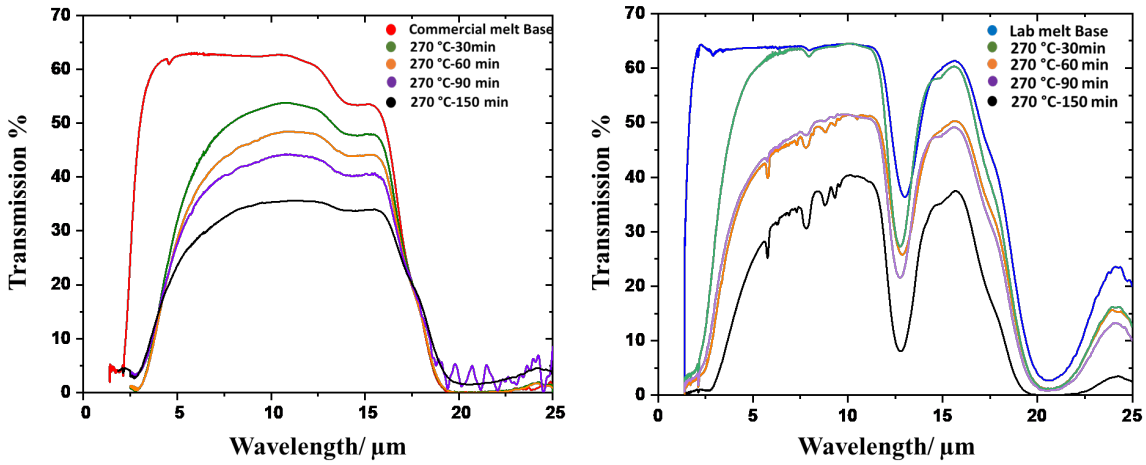

Figure 2 Illustrates Transmission spectra of commercial and lab melt, following identical heat-treatment protocol.

The volume fraction of the various heat-treated lab and commercial melt samples are shown in Table 1. A calibration curve to assess the unknown, post heat -treatment volume fraction was prepared as a reference. A known volume fraction of PbSe crystal phase was mixed with the amorphous base glasses. Any X-ray shielding due to the presence of Pb on the signal was evaluated [1]. Using the calibration curve, known peak area and volume fraction was used to calculate the volume fraction of the individual crystallites in the heat-treated glass ceramics

Sample	Nucleation (220 °C 2 hrs.) + Growth	As_2Se_3	PbSe	$(Ge_{0.1}Pb_{0.9})Se_1$	Se	Total Volume fraction
Commercial Melt	270 °C-30 min.	11.45 (±1.67)	1.34(± 0.34)	0.89 (± 0.43)	0.36 (± 0.02)	14.04
	270 °C-60 min.	16.54 (±16.54)	3.56 (± 0.45)	2.03 (± 0.67)	0.88 (± 0.12)	23.01
	270 °C-90 min.	18.92 (± 2.45)	6.34 (± 1.67)	2.75 (± 0.56)	1.86 (± 0.43)	29.87
	270 °C-150 min.	25.46 (± 2.98)	7.47 (± 1.45)	3.37 (± 0.92)	2.43 (± 0.87)	38.73
UCF Melt	270 °C-30 min.	3.75 (± 1.32)	6.38 (± 2.65)	2.43(± 0.69)	1.67 (± 0.28)	14.23
	270 °C-60 min.	5.45 (± 1.89)	14.46 (± 2.34)	3.08 (± 0.89)	2.0 (± 0.68)	24.99
	270 °C-90 min.	8.41 (± 1.96)	19.95 (± 3.67)	6.67 (± 1.03)	3.46 (± 1.03)	38.49
	270 °C-150 min.	9.32 (± 0.97)	21.13 (± 2.45)	7.77 (± 1.13)	3.92 (± 0.97)	42.24

Table 1. Volume fraction of the crystalline phases in the lab melt and commercial melt following similar heat treatment protocol.

1. Sisken, L., Laser induced crystallization mechanisms in chalcogenide glass material for advanced optical functionalities, in College of Optics and Photonics. **2017**, University of Central Florida: Orlando.