

# Solvent processing unlocks **low-temperature** processes to synthesize **metastable** chalcogenide glass thin films



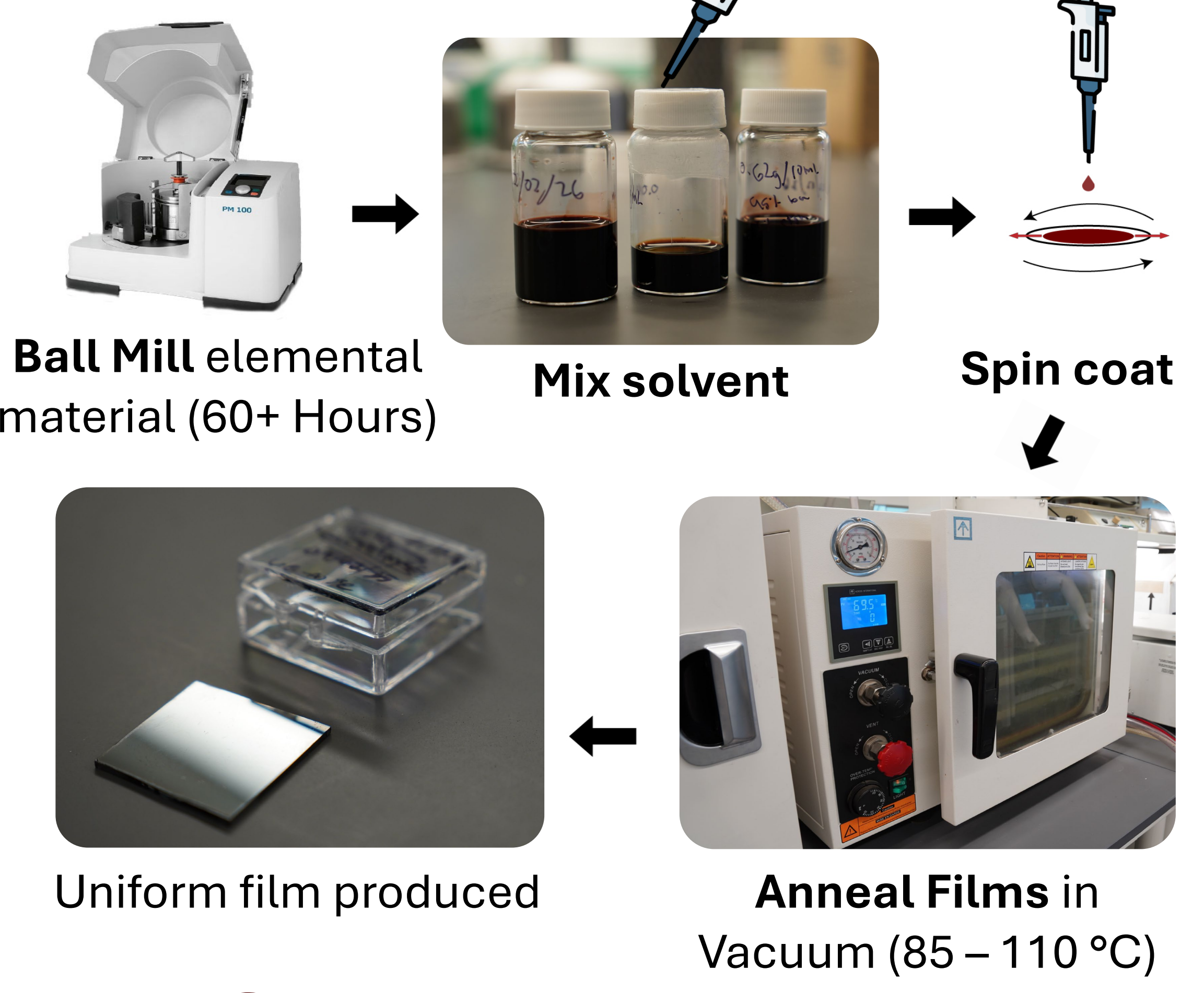
## Background

**High-temperature** melt processing limits integration and composition of **phase-change chalcogenide** glasses.

These materials exhibit **strong infrared transmission** and **reversible amorphous-crystalline transitions**, producing large contrasts in refractive index and elastic modulus, useful in photonics and acoustic devices.

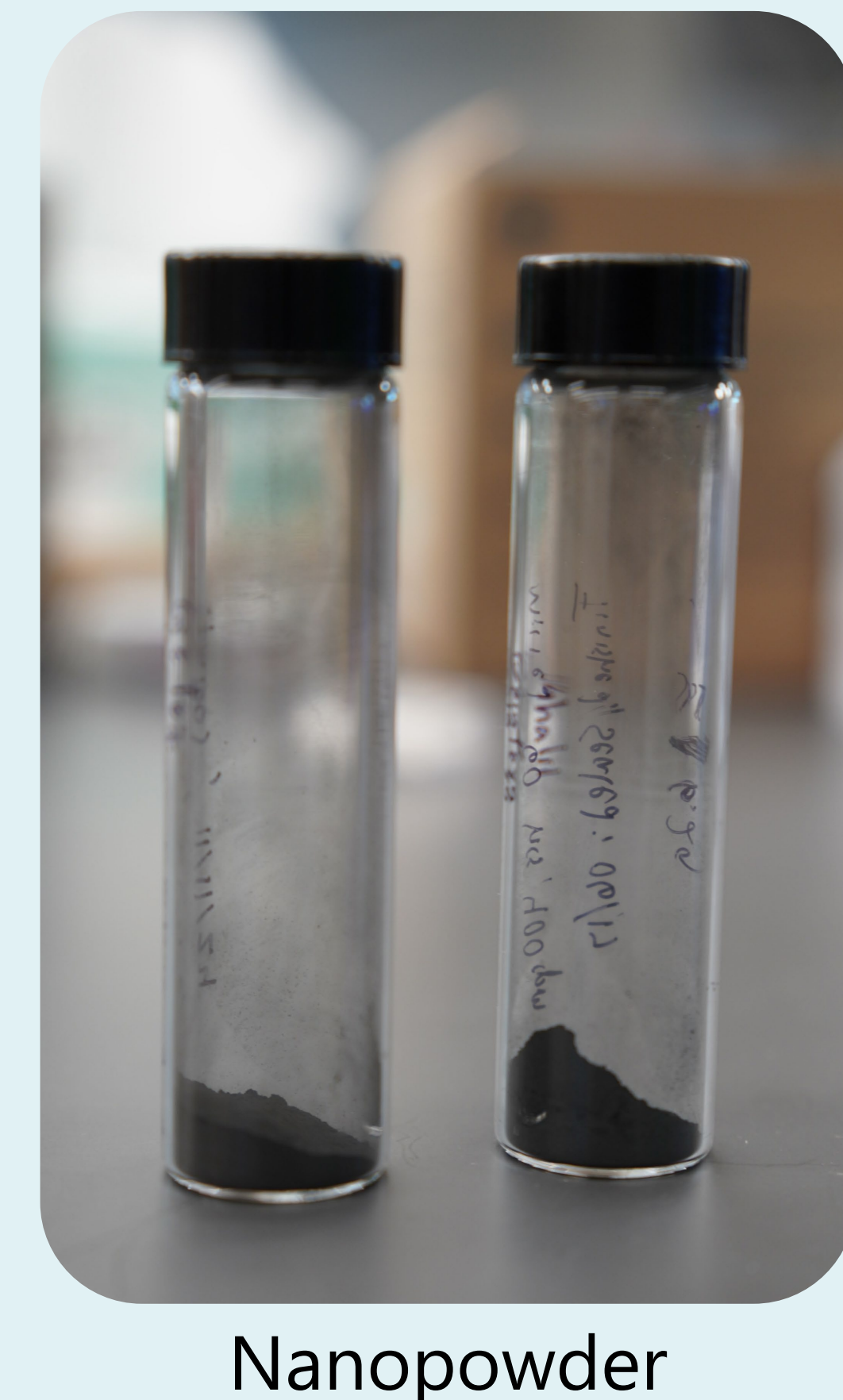
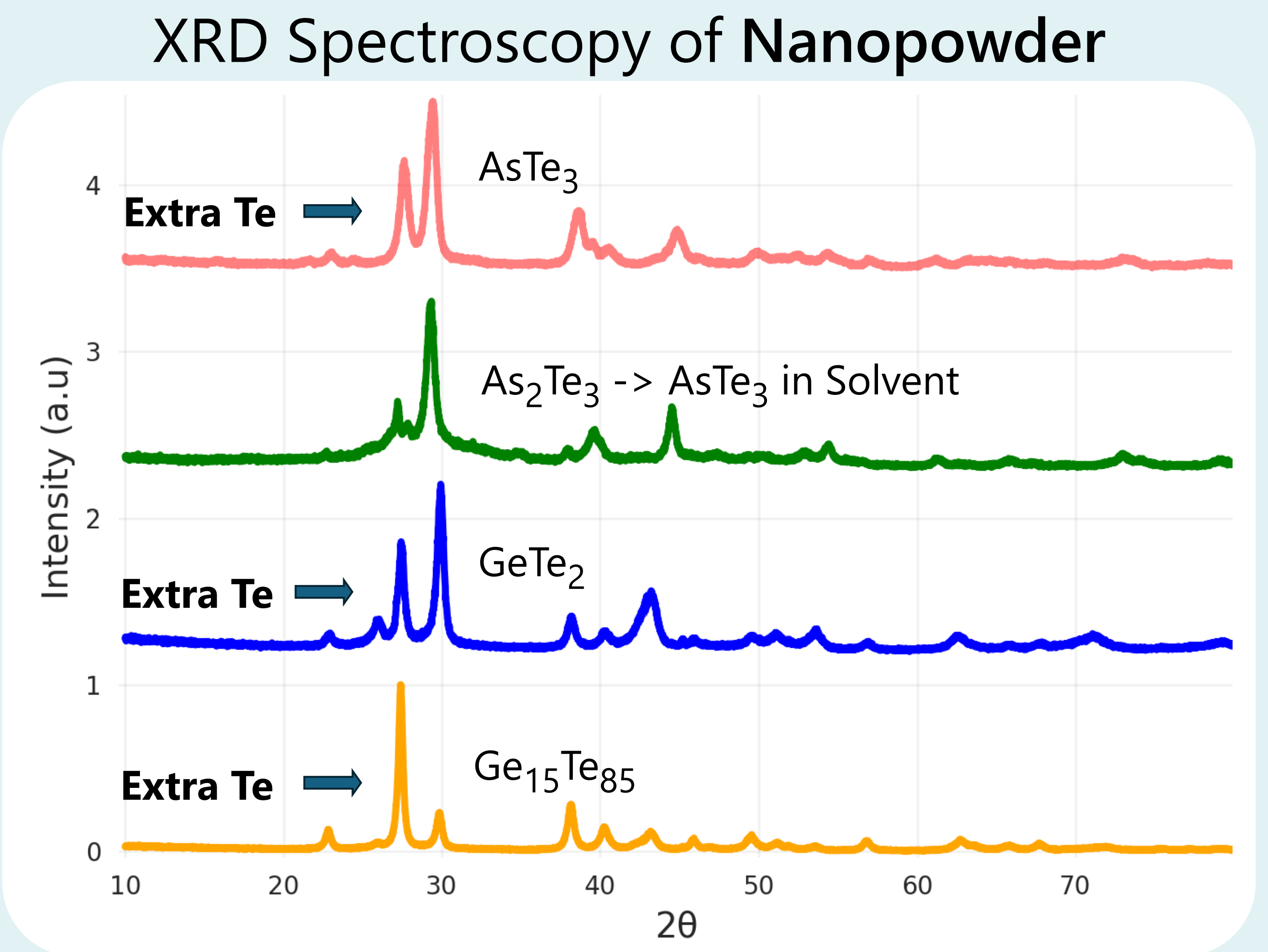
We demonstrate **direct thin-film synthesis** from **elemental precursors at  $\leq 120^\circ\text{C}$** , stabilizing metastable glass compositions with strong optical phase contrast.

## Methods

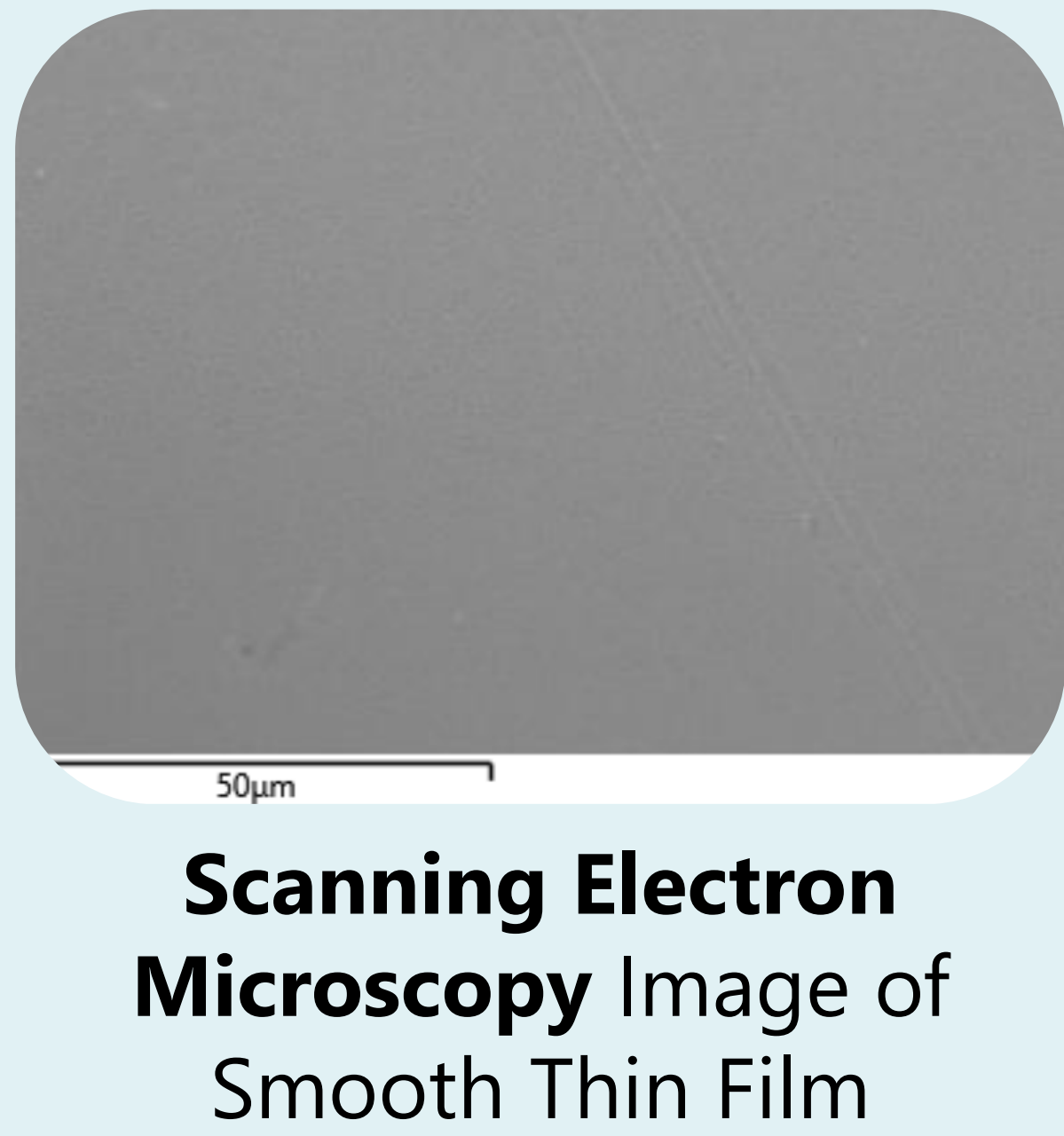
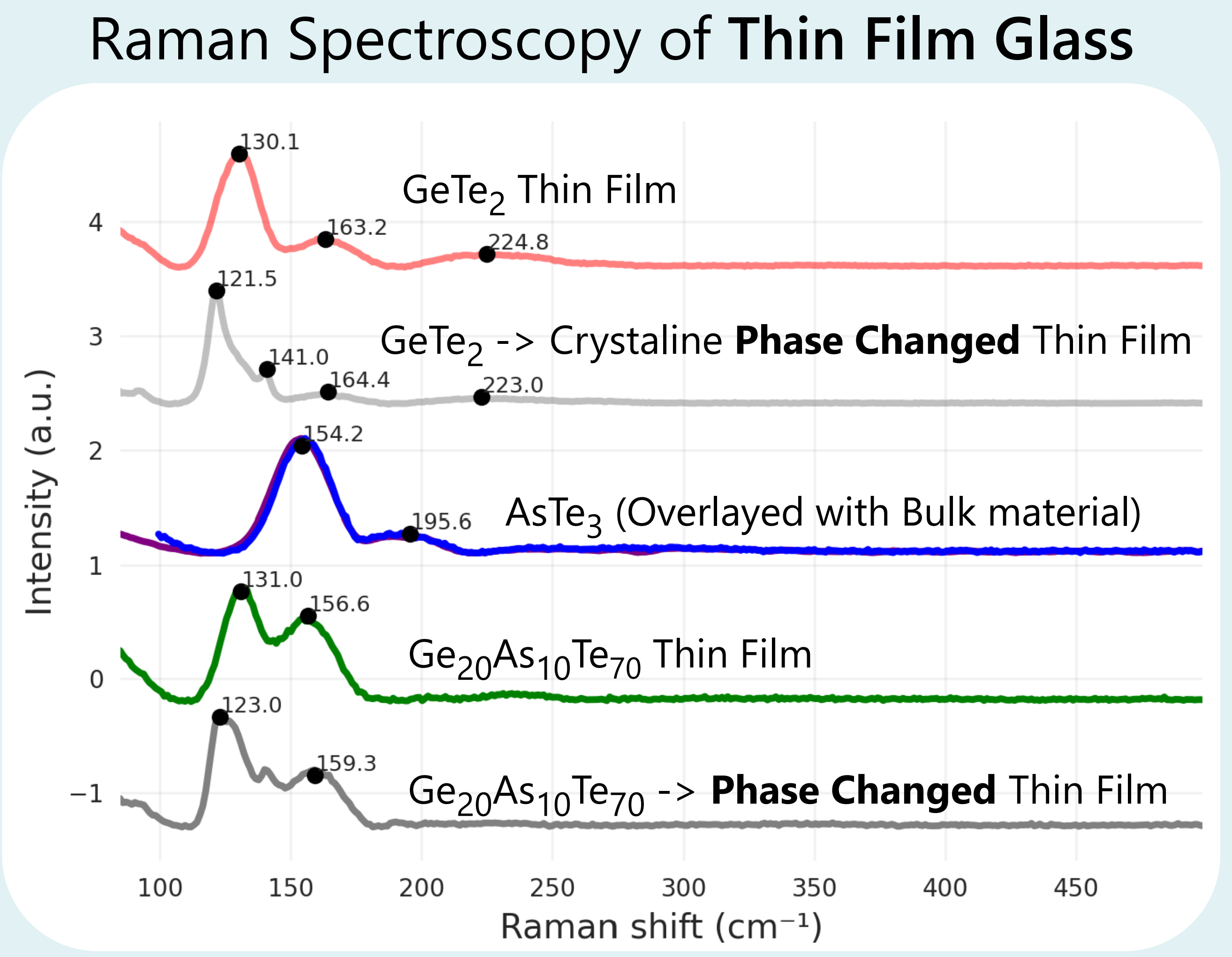


## Next Steps

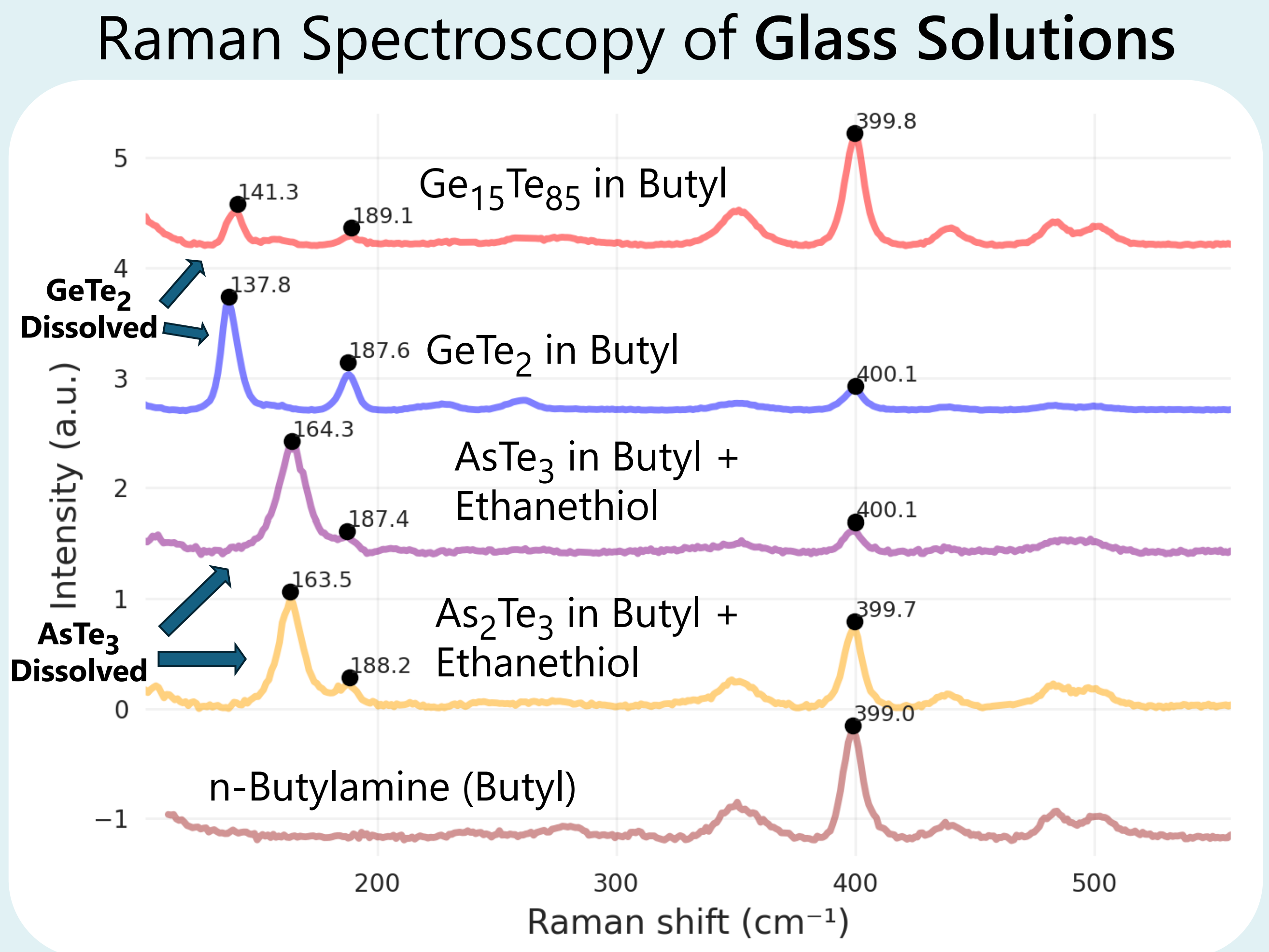
- Integrate into **topological acoustic** and **nonlinear photonic** devices.
- Develop solvent-based **additive manufacturing methods** with solutions.
- Refine deposition and Direct Laser Writing parameters to produce smoother thin films and well-defined nanostructures.



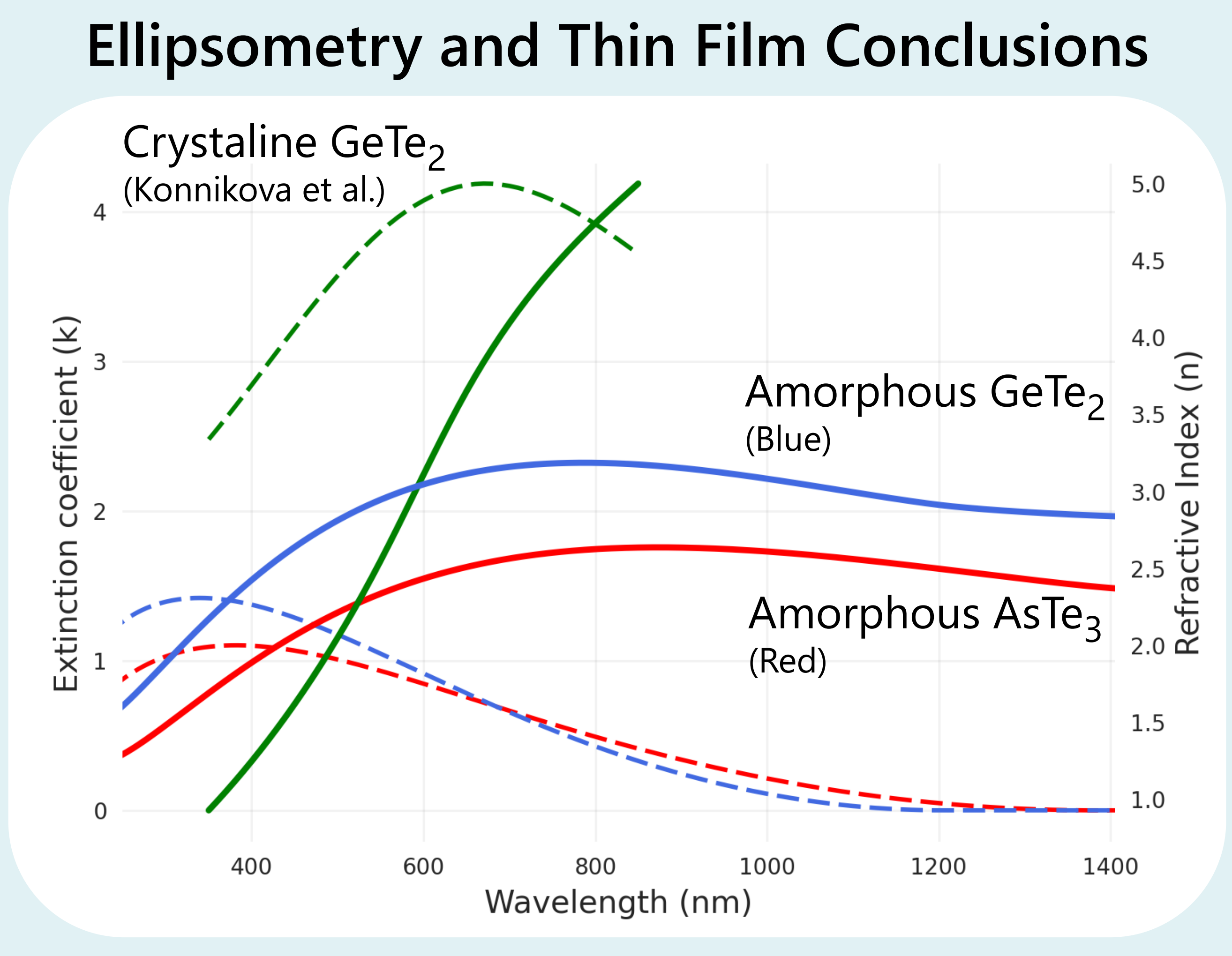
**Ball milling** reacts powder in **stable crystalline phases** (GeTe and As<sub>2</sub>Te<sub>3</sub>). Excess Te remains in off-stoichiometric mixtures.



**Broad peaks** confirm successful **amorphous deposition** at low temperature. **Mixing** AsTe<sub>3</sub> and GeTe<sub>2</sub> solutions produces **GeAsTe** glasses.



**Materials dissolve into unstable compositions** suggesting that solvent processing provides access to unconventional compositions.



**High phase contrast** in GeTe<sub>2</sub> and high refractive index in AsTe<sub>3</sub> **indicate suitability for phase change photonics.**

The low extinction coefficient in the glassy phase indicates that our **low-temperature solvent process yields excellent, optical-grade films.**

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References and Supplemental Material