New functionality & superior performance of glass – Himanshu Jain

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By exploiting the metastable state of glass ***we can create new materials and structures with novel functionality and exceptional properties***.

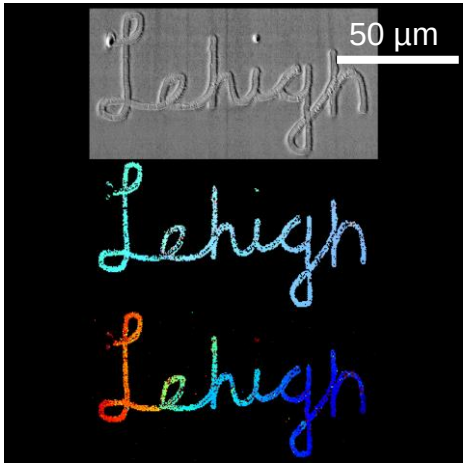
This requires atomistic understanding of how the structure and properties of glass can be modified selectively in space and time by external fields (lasers, electron beam, electrical field, mechanical stress, etc.)

We conduct in-situ experiments and modelling to ***enable development of glasses with enhanced functionalities***

To learn more:

- Structuring of glass for new functionality:
- Laser fabrication of single crystal architecture in 3D: see Materials & Design (2018) - doi.org/10.1016/j.matdes.2018.03.016.
- Crystal architecture with curved lattices: see Int. J. Appl. Glass Sci. (2022) - doi.org/10.1111/ijag.16574

As a recent example, we have transformed disordered glass into highly ordered rotating lattice single crystal architecture wherein lattice orientation is varied gradually at a controlled rate → The lattice is engineered by controlling the temperature and stress at the growth front by changing beam current and scan rate.



Free hand writing of rotating lattice single crystal microarchitecture in an Sb-S-I glass by an electron beam.

Top to bottom: SEM image, inverse pole figure, and crystal orientation deviation map showing gradual variation of lattice orientation

Call to action: Professor Jain is dedicated to advancing use-inspired research, which has been formalized in the Pasteur Partners PhD (P3) program (wordpress.lehigh.edu/inphd/) at Lehigh. He welcomes collaboration with industry (companies, national labs, defense and healthcare organizations) which are familiar with beneficial uses of glass for society.