**A Global Analysis of Mechanical Properties of Organic Glasses Below *T*g**

(Author list: Vikram Chandrashekhar Joshi 1, Changquan Calvin Sun1,\*

*1Department of Pharmaceutics, University of Minnesota, USA*

*\* Corresponding Author*

**Purpose:** To developa comprehensive understanding of the mechanical properties of organic glasses and crystals, which can be used to fully unlock their potential as functional materials across pharmaceutical industry.

**Methods:** The Young’s modulus and hardness of twelve pharmaceutical organic glasses and crystals (specific facets) were measured using nanoindentation. Additionally, the density values of all samples were obtained using helium pycnometry and converted to corresponding molar free volumes.

**Results:** Our results indicate that the distribution of Young’s modulus and hardness in glasses is significantly narrower than that in corresponding crystalline solids, primarily due to the elimination of structural anisotropy. Moreover, we found that the glasses with higher molar free volume tend to be softer than those with a lower molar free volume.

**Conclusions:** These findings are expected to help pharmaceutical materials scientists choose or design the right solid form for the right applications.

**Keywords:**

Organic glasses; mechanical properties; nanoindentation; anisotropy; free volume