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Quantitative Relations Between Cooperative Motion and Emergent Elasticity in Model Glass-Forming Polymer Materials BEATRIZ A PAZMINO BETANCOURT, Wesleyan/NIST, PAUL HANAKATA, FRANCIS W STARR, Wesleyan, JACK F. DOUGLAS, NIST — There are many semi-empirical models that allow us to understand the dynamics of glass-forming liquids. Some of them emphasize the importance of a progressively growing cooperative motion which grows while the configuration entropy of the liquid drops. Others from a solid-like nature of glass perspective look at the emergent elasticity. However, there has been limited success in finding a unify framework of understanding such different perspectives. In this work, we find quantitative relations between emergent elasticity in terms of the average local volume accessible for particle motion, and the growth of the collective motion in super cooled liquids. Surprisingly, we find that each of these models of glass-formation can equally well describe the relaxation data for a large range of fragility variations of glass-forming liquids, such as polymer nanocomposites, and thin films, as well as in a BLJ liquid that we have simulated.

Beatriz A Pazmino Betancourt
Wesleyan/NIST

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