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Takeaki Araki ”Cooperative motion caused by by thermally activated jumps in Johari-Goldstein mode”

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Johari-Goldstein (JG) relaxation is a relaxation phenomenon observed in supercooled liquids and glasses, and plays a significant role in impacting various properties. We delved into the JG mode in both ionic glass CKN and metallic glasses, employing molecular dynamics simulations. Our simulations unveiled the intricate microscopic dynamics characterizing the JG mode. Specifically, we observed that a subset of particles undergoes thermally activated jump motions. These jump motions triggered a collective local relaxation among neighbouring particles that were conventionally assumed to be immobile. This collective relaxation, involving both jumping and non-jumping particles, played a pivotal role in the stress relaxation of the entire glass structure. By bridging findings from gamma ray quasi-elastic scattering experiments with the computational insights, our work provides a deeper understanding of the underlying mechanisms governing the JG mode in diverse glassy materials.