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Atomistic study of rejuvenation of amorphous metals via thermal loading MASATO WAKEDA, Osaka University, JUNJI SAIDA, Tohoku University, JU LI, Massachusetts Institute of Technology, SHIGENOBU OGATA, Osaka University — Rejuvenation is the structural excitation of amorphous system accompanied by enthalpy and free volume rise, and it is one of the promising approaches for improving the deformability of amorphous metals, which usually exhibit macroscopic brittle fracture. However, methods for controlling the rejuvenation and feasibility conditions of the rejuvenation remain unclear because of few experimental evidences and lack of clear knowledge of nonequilibrium glass properties. In this study, we investigate a method to control the rejuvenation through thermal loading and the feasibility conditions of the thermal rejuvenation. Using molecular dynamics techniques, we constructed an amorphous alloy model via melt-quenching process, and then conducted annealing and quenching processes. It is observed that thermal rejuvenation occurs via a thermal loading process of annealing at temperatures above a critical value and subsequent quenching at a cooling rate that is higher than that of the initial melt-quenching process. The level of rejuvenation increases with increasing annealing temperature and quenching rate. We discuss the background nature of rejuvenation and potential application of thermal rejuvenation to control the mechanical properties of amorphous metals.

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