Study of an Atomic Compressive Material Behavior at High Strain Rate Compression in a Simple Aluminum System

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Aluminum alloys are one of the structural materials with novel properties for building functional parts. Aluminum alloys are light metal alloys which have high demand in aerospace and automotive industries. In structural applications, functional parts are designed for over a broad range of strain rates and temperatures. A numerical simulation was performed to characterize an aluminum (Al) system at high strain rate uniaxial compressive loading conditions. We deformed the Al system at room temperature to higher temperatures with zero pressure. Al has face-centered cubic structure and we use four thousand atoms in periodic boundary conditions to perform the analysis. We used a modified embedded atom method, a widely used atomic level semi-empirical model for metals and impurities, for many-body interatomic potentials for monoatomic metal. We found characteristic material behavior for the Al system at different temperature at high strain rate compressive loading.