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Molecular Dynamics simulation of Ru flattening by Gas Cluster Ion Beam MASAAKI MATSUKUMA, KAZUYOSHI MATSUZAKI, Tokyo Electron Limited, KENJI INABA, RYUJI MIURA, AI SUZUKI, NOZOMU HATAKEYAMA, AKIRA MIYAMOTO, Tohoku University — Noble metals such as platinum or ruthenium have been hardly used in the semiconductor devices in spite of their physical and electrical properties, because they were hard to process. High energy monomer ion beams which can cut hard materials may induce structural damages. A gas cluster ion beam (GCIB) consists of a few thousands of atoms or molecules and is accelerated up to several tens keV. GCIB is able to realize localized high energy deposition with low energy per components in the cluster. This means that each component in clusters cannot have enough energy to react with surface. On the other hand, the clusters with tens keV of kinetic energy may make a high reactive field at the hypocenter areas. In consequence it is expected that the GCIB irradiation should achieve the metal processing with low damage. Recently flattening of Ru thin films using GCIB is reported. We conducted molecular dynamics simulation of GCIB incident to Ru surface with the in-house interatomic potential models obtained based on the quantum chemical calculations and found that the internal degree of freedom of a cluster played important roles during the GCIB bombardment.

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