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Sputtering characteristics of carbon-based materials exposed to H/D/T plasmas — molecular dynamics simulation study SATOSHI HAMAGUCHI, Center for Atomic and Molecular Technologies, Graduate School of Engineering, Osaka University, MASASHI YAMASHIRO, College of Industrial Technology, Nihon University — Erosion of carbon-based materials facing magnetically confined plasmas is of significant concern for fusion devices. Sputtering properties of graphite and amorphous carbon substrates due to hydrogen (H), deuterium (D), and tritium (T) ion bombardment have been studied at low incident energies using classical molecular dynamics (MD) simulations. MD simulations have been performed in such a way that we allow significant accumulation of incident species up to 1.25 $\times 10^{17}/\mathrm{cm}^2$. Our simulation results indicate that a high level of H/D/T dose accumulation on the top surface is prerequisite for the formation of relatively large-sized sputtered hydrocarbon species. Significant isotopic dependence of sputtering yields has been also observed after the dose of incident D or T reaches about $10^{16}/\mathrm{cm}^2$. It has been clearly shown that the sputtering yield can be lower at higher incident energies in the low energy range for D and T injections. These simulation results are consistent with some of earlier published experimental observations of carbon-based material sputtering. For comparison, we shall also present sputtering properties of Si-based materials exposed to chemically reactive plasmas, which have relevant applications for semiconductor processing.

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