

Abstract Submitted
for the GEC13 Meeting of
The American Physical Society

Molecular dynamics simulation of plasma-induced Si substrate damage: Latent defect structures and bias-frequency effects¹ KOJI ERIGUCHI, ASAHIKO MATSUDA, YOSHINORI TAKAO, KOUICHI ONO, Kyoto University — Plasma-induced physical damage (PPD)—the ion bombardment on Si substrate—has been one of the critical issues for fabricating scaled electronic devices [1], because it degrades the device performance and reliability [2]. The typical damaged structure consists of a surface layer and latent defect sites underneath the surface. To minimize PPD, various techniques that control an ion energy distribution function (IEDF) have been developed [3]. In this study, a classical molecular dynamics (MD) simulations [4] were performed in various gas systems (Ar, Xe, Cl, Br etc.) to clarify the latent defect structure and the effects of IEDF on PPD, where incident ion energies were defined to obey a given IEDF—substrate bias frequency. We revealed that both the density of defect site and the damaged-layer thickness were weak functions of IEDF, which are consistent with a binary-collision-based range model and experimental results [5].

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¹Grant-in-Aid for Scientific Research (B) 23360321 from JSPS

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Date submitted: 14 Jun 2013

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