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Damage formation mechanisms of Si and Ge substrates by ion bombardment MASAAKI MATSUKUMA, TAMOTSU MORIMOTO, Tokyo Electron Limited, MICHIRO ISOBE, KAZUHIRO KARAHASHI, SATOSHI HAMAGUCHI, Osaka University — Recently the choice of materials for most advanced semiconductor devices, which typically have three dimensional (3D) structures rather than planer ones, has been changing from silicon to III-V compounds or germanium. Such changes have brought renewed interest in physical damages caused by ion bombardment because, in typical gate etching processes of 3D devices, the channel surfaces are exposed directly to the ion irradiation from the plasma. The angles of ion incidence on 3D device gates can be much larger than those on 2D planer devices. Therefore a better control of the damage layer formation on modern 3D devices requires a better understanding of the damage formation mechanisms on such new materials and structures. In this study, damage formation processes by energetic ion bombardment have been simulated for Si/Ge/SiGe substrates by molecular dynamics (MD) simulations and dependence of ion induced damages on species of incident ions and their doses has been examined. Based on the simulations results, damage formation mechanisms will be discussed and a semi-analytical model to predict the damage extent formed by ion bombardment will be also presented.

Masaaki Matsukuma
Tokyo Electron Limited

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