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Measuring potential energy dissipation effects via below-surface electronic excitations in solids using MOS devices DHRUVA KULKARNI, RADHEY SHYAM, DANIEL FIELD, JIM HARRISS, DANIEL CUTSHALL, WILLIAM HARRELL, CHAD SOSOLIK, Clemson Univ — We have conducted measurements on oxides irradiated by multicharged ions ($Q > 1$) to explore the potential energy/charge state effect on subsurface damage caused in the target. Our goal was to determine charge state dependence of stopping power, or energy lost per unit distance, relative to the singly charged ($Q = 1$) ions usually encountered in ion-solid interactions. Specifically, we have irradiated a 170 nm thick SiO_2-on-Si sample with Ar^{Q+} ions ($Q = 1, 4, 8, 11$) at a fixed K.E. of 1 keV and tracked the electronic excitations in the oxide by capacitance-voltage (C-V) characterization post irradiation. Energy dissipation within the oxide generates electron-hole pairs which leads to mobile holes that can transport across the oxide and have a finite probability of getting trapped within the oxide, which causes a flatband voltage shift in its C-V curve. To obtain C-V characteristics, we deposited top metal contacts on our oxides to create MOS devices (Al-SiO_2-Si). These measurements showed increased flatband voltage shifts dependent on impact position, ion dose and the ion charge state. the ion charge state. Preliminary analysis reveals a power law ($Q^{2.2}$) dependence on the charge state which is compared to theoretical predictions and other experimental studies.

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