The introduction of subthreshold induced defects in germanium by above threshold radiation exposure

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Ultrapure germanium doped with antimony to a concentration of 10^{15} cm^{-3} was irradiated with α-particles from an americium-241 source. The defects introduced have been reported on before and remain, except for the e-center, unidentified [1]. By subjecting a second sample to a low energy (20 eV) Ar plasma etch and subsequent anneal the number of defects that were previously undetectable by deep level transient spectroscopy (DLTS) were further reduced. Such plasma etched germanium has been shown to be impervious to defect introduction in processes like electron beam deposition that typically exposes materials to subthreshold irradiation. Comparing the defects introduced when the second sample was exposed to α-particle irradiation by the same source yielded the following results. While the e-center introduction remained largely unchanged, the concentration of all other defects was lowered to some degree. $E_{0.21}$ and $E_{0.24}$ that are typically observed after α-particle irradiation were absent from the DLTS spectrum of sample 2. These differences in the spectra indicate that in the control, more than one defect creation process was responsible for the defects observed whereas in sample two only the defects that are created by the displacement of native germanium atoms were observed.

1. F. D. Auret, W. E. Meyer, S. Coelho, M. Hayes, "Electrical characterization of defects introduced during electron beam deposition of Pd Schottky contacts on n-type Ge." *Applied Physics Letters*, **88**(24), 242110 (2006).