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THE ROLE OF ION MASS ON END-OF-RANGE DAMAGE IN SHALLOW PREAMORPHIZING SILICON.

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Preamorphization is commonly used in the shallow junction formation of silicon CMOS devices. The purpose of this experiment was to study the effect of the preamorphizing species' mass on the interstitial concentration at the end-of-range region. Isoelectronic species of Si, Ge, Sn and Pb were compared. Silicon wafers with a CVD grown-in buried boron marker layer (5000Å deep) were amorphized using implants of 17 keV $^{28}Si^{+}$, 32 keV $^{73}Ge^{+}$, 40 keV $^{119}Sn^{+}$ or 45 keV $^{207}Pb^{+}$ resulting in similar amorphous layer depths. All species were implanted at a dose of 5_$10^{14}/cm^{2}$. Cross-sectional transmission electron microscopy (XTEM) and Spectroscopic Ellipsometry were used to measure amorphous layer depths (approximately 400Å). Post-implantation anneals were performed at 750°C for times ranging from 15 to 240 minutes. Plan-view transmission electron microscopy (PTEM) was used to observe and quantify the defect evolution path upon annealing. Secondary ion mass spectrometry (SIMS) was used to monitor the transient enhanced diffusion (TED) of the buried boron marker layer caused by the end of range damage of the amorphizing implants. Base upon the SIMS results the Florida object-oriented process simulator (FLOOPS) calculated the resulting diffusion enhancements. Results show that increasing the ion mass over a significant range (28 to 207 AMU) can result in reduced interstitial injection and TED.

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