The defects disordered the atomic structure of the HOPG surface. A kind of atomic arrangement stands above the hillock was found on some of the latent tracks. As shown in Fig. 3(b), the graphite lattice with the classical interatomic distance of 0.14 nm is observed on the hillock. As previously observed in HOPG samples irradiated by swift heavy ions (SHIs)[1,2], a kind of superstructures superimposed on the normal graphite structure. The unit cell of this superstructure is hexagonal with a measured lattice parameter of 0.42 nm. While the atomic structure observed above the hillock on HOPG irradiated by HICs is comparatively different from the superstructures observed on HOPG irradiated by SHIs. This may be related to different energy loss mechanism of HCI and SHI. More work need to be done to figure out the real source of this different new structure.

References

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4 - 21 Investigation of Heavy Ion Flux Effect on Multi-bit Upset in Bulk-Si SRAMs

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Heavy ion flux is an important irradiation parameter in single event testing. Until now, not too much study was conducted concerning ion flux effect. In this work, flux effect on multi-bit upsets in bulk-Si SRAMs was investigated using Bi ions with the LET of 99.8 MeV·cm^2/mg over the flux range from 10 to 2×10^4 ions/(cm^2·s). The tested devices were 90 nm bulk-Si SRAMs with memory size of 1 Mb (DUT #1) and 512 kb (DUT #2).

Fig. 1 displays the test results of SEU cross sections for the two devices. The cross sections deviated within 20% as the ion flux increased and the two devices showed different trends. We calculated the MBU composition of how many bits for each test result. Fig. 2 shows the percentage of the MBU composition with red bar represents the MBUs under three bits (including three bits) and black bar represents the MBUs above three bits. At low flux range, the MBUs of fewer than three bits (including three bits) dominated, and as the flux increased, the MBUs involving more than three bits increased.

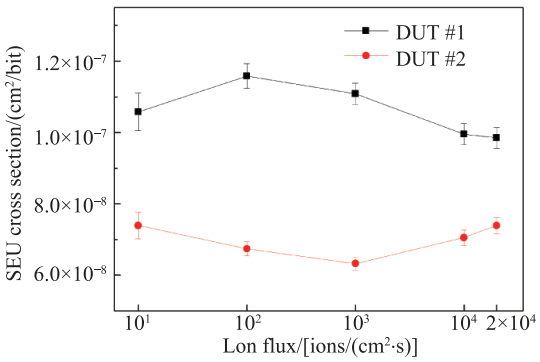

Fig. 1 (color online) The SEU cross sections as a function of ion flux at the LET of 99.8 MeV·cm^2/mg for the bulk-Si SRAMs.

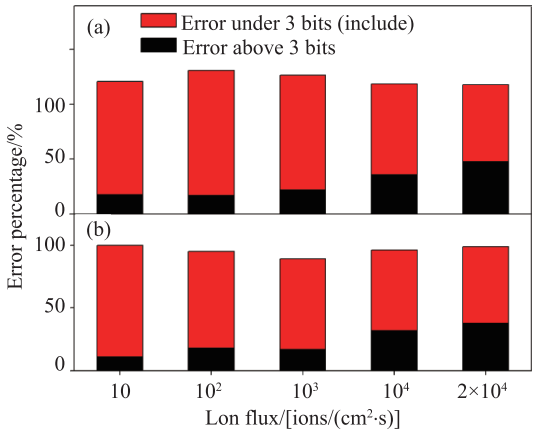

Fig. 2 (color online) Percentage of the MBU composition for the bulk-Si SRAMs (a) DUT #1 (b) DUT #2.

As the analysis of the MBU composition shows that, in the lower flux range, below 10^3 ions/(cm^2·s), the changes in test results are not obvious. As the flux increases above the 10^3 ions/(cm^2·s), the effect of ion flux on SEU rates become evident. The flux effect is related to the cross sectional distribution of the ion beam, which is determined by the beam transportation and modulation mechanism of the high energy ion acceleration system. As the flux increases above 10^3 ions/(cm^2·s), the localization effect of ion beam cannot be ignored and further study need to be taken to fully investigate the MBU mechanism.