Unexpected Surface Implanted Layer in SRAM Devices Observed by Microwave Impedance Microscopy

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Real-space mapping of dopant concentration in semiconductor devices is of great importance for the microelectronics industry. We resolve the local conductivity distribution of a static random access memory (SRAM) sample with scanning microwave impedance microscopy (MIM). The MIM electronics can also be adjusted to the scanning capacitance microscopy (SCM) mode, allowing both measurements on the same region. Interestingly, while the conventional SCM images match the nominal device structure, the MIM results display certain unexpected features, which originate from a thin layer of the dopant ions penetrating through the protective layers during the heavy-ion implantation steps.

**Left figure:** MIM, dC/dV images, and single line cuts of the p-type and n-type epitaxial layer staircase silicon samples. Scale bars are 2 μm.

**Right figure:** (a) Topography image of the SRAM sample. (b) MIM images of the rectangular and H-shaped devices. Unexpected bright regions due to the ion implantation are observed for the rectangular device. Scale bars are 5 μm.

REFERENCE:

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