Applications Data Sheet
Charge Reduction of Photoresist with Hitachi's S-4700 FE-SEM

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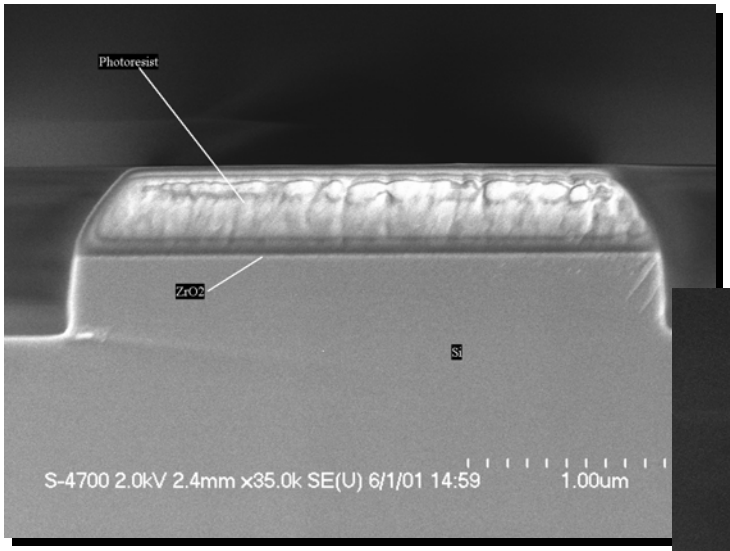
FILTERING SECONDARY ELECTRON SIGNAL FROM THE UPPER SE DETECTOR IMAGE ELIMINATES THE APPEARANCE OF CHARGE ON PHOTO RESIST.

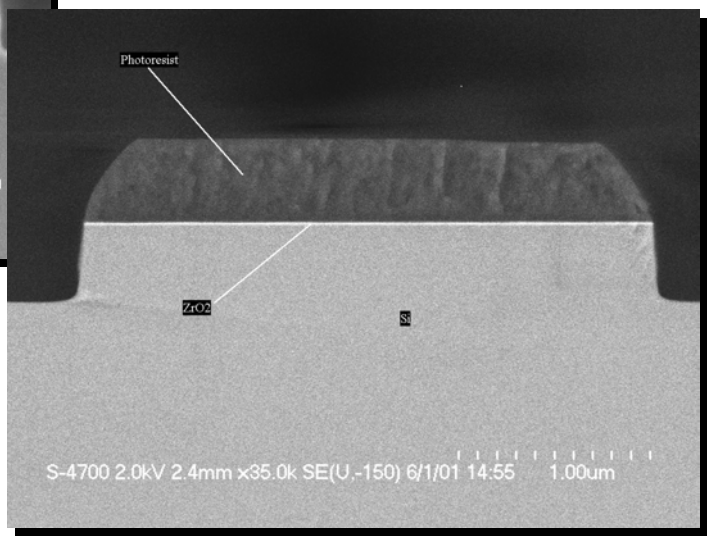
When imaging semiconductors specimens containing photo resist Hitachi's S-4700 New ExB Filter can reduce charge appearance so that discrete atomic differences can be distinguished. By selectively filtering out the low energy electrons that contain information about the very surface of the specimen, where charge is prevalent, the appearance of charge can be eliminated. By using the new ExB Filter the image contrast becomes compositional in nature. At low accelerating voltages (2kV) the specimen can be examined for compositional information while charge is removed from the image and beam drift is reduced at the sample. The following micrographs demonstrate the usefulness of the new E X B filter:

1. To reduce charge in the image. (At the area of the photoresist)
2. To enhance compositional contrast. (Visible layering of materials)
3. To image very small atomic layers in a semiconductor device. (At the area of ZrO_2)

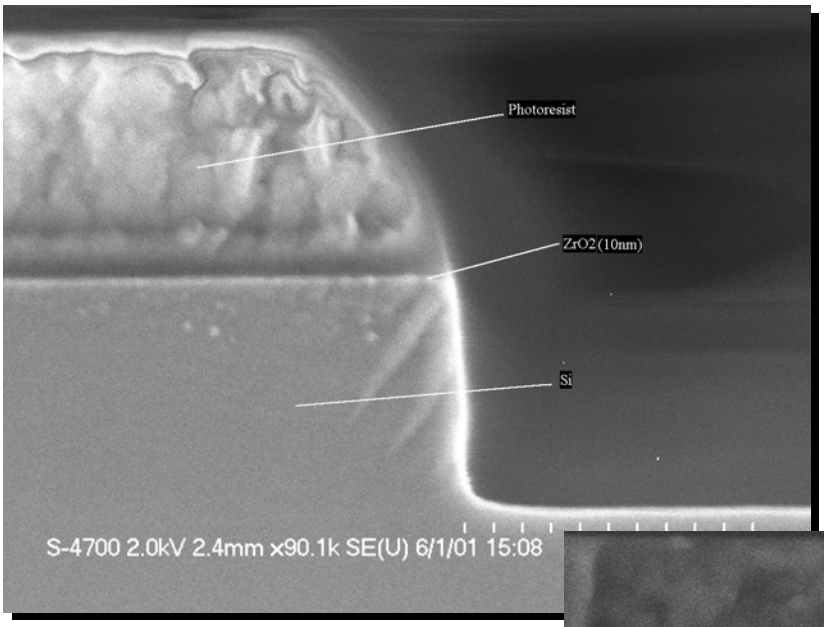
The specimen is courtesy of Stanford University. It is Photoresist on Si with a 100 angstrom layer of ZrO2.



Pure SE Upper Detector

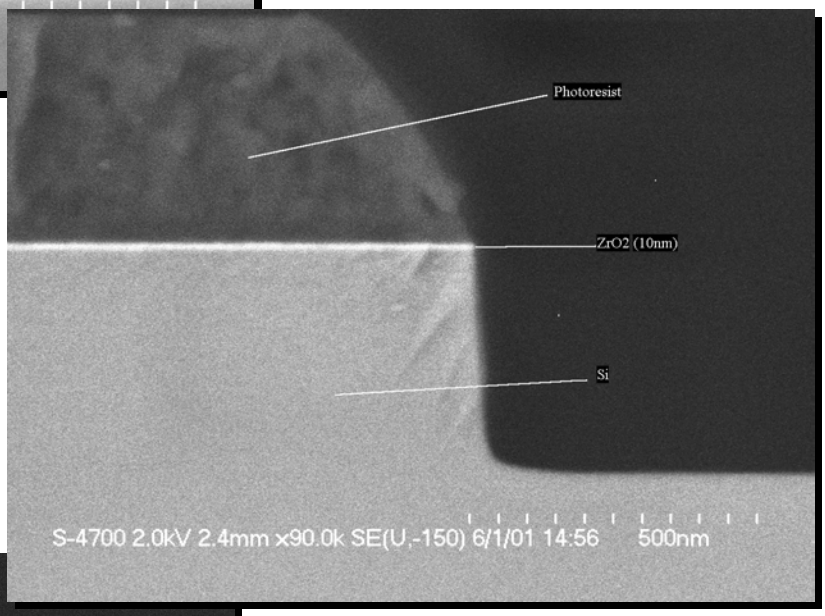


With E X B in full BSE Mode

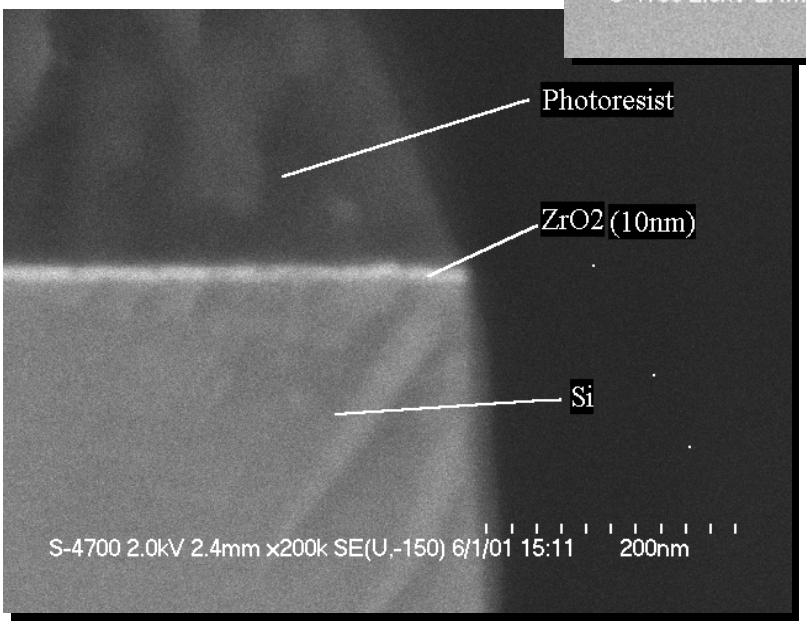


Pure SE Upper Detector

Transitioning from pure secondary signal to pure backscatter signal eliminates the charging in the image and enhances structure in the photo resist.



With E X B in full BSE Mode



E X B in Full BSE Mode

With the new ExB filter in a full BSE mode the ZrO2 layer is clearly seen. Additionally, the 2kV accelerating voltage assists in reducing the possibility of drift so that an image at 200,000x magnification can be captured.