Nano-Transmission X-ray Microscopy at NSRRC

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The optical design of a nano-Transmission X-ray Microscope (nTXM) newly constructed at National Synchrotron Radiation Research Center will be presented. Inheriting the generic design of a full-field transmission microscope, the NSRRC n-TXM adopts several aggressive optical concepts and advanced optical components, including a tapered-capillary condenser, a high-performance micrometer zone plate (ZP) with outermost zone width 50 nm and aspect ratio 18, the first application of a higher ZP diffraction order to achieve a spatial resolution less than 30 nm, and a Zernike phase-contrast mode for imaging light specimens. The TXM has been applied in a wide variety of research fields in, for example, the analysis of failure mechanisms in microelectronic device, the tomographic structures of naturally grown photonic specimens, the internal structure of fault zone gouges from earthquake core, etc. In this paper, we would like to share the scope and the prospective of the project as well as the progress of the nTXM in NSRRC. Several applications on the microscope will be presented as examples.
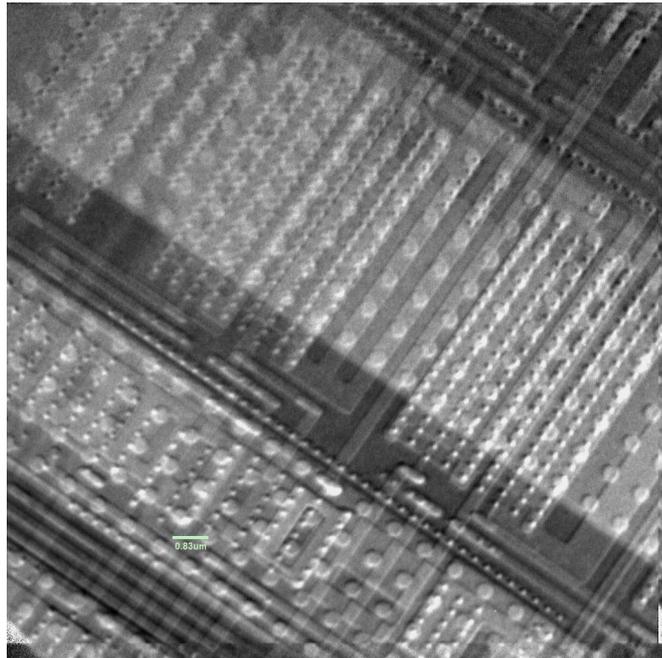

FIGURE: A multi-layered copper interconnected integrated circuit imaged by elemental contrast mode. The image contrast of the copper wires was enhanced by subtracting the two images acquired below (8.4 keV) and above (9.5 keV) the specific absorption edge of copper (8.98 keV).

References:

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