

## **An energy tunable hard x-ray microscope for IC investigation**

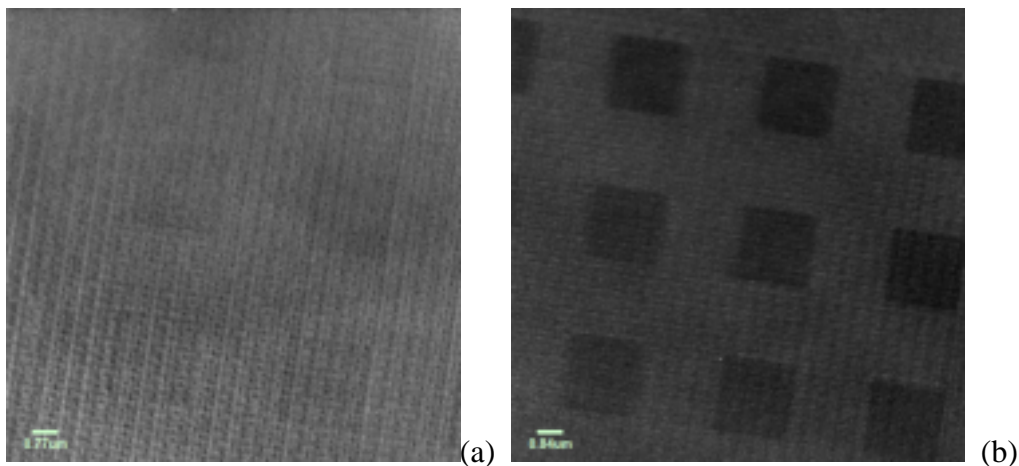
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An energy tunable tomographic transmission hard X-ray microscope with spatial resolution better than 60nm was developed by NSRRC and Xradia Inc. The x-ray energy is from 8 keV to 11 keV provided by the superconducting wavelength shifter source at NSRRC. The microscope utilizes three different zone plates for different energies. The chosen energy range is well suited for most IC materials; Cu, Ta, W, Ga, As and Ge etc. With tunable energy microscopy, the materials of the IC sample can be identified with respect to different absorption edges as shown in Fig (a) and (b). These two pictures show Cu pads imaged at two different energies. The Cu contrast is enhanced when imaged by x-rays above the Cu absorption edge. Contrast enhancement of copper interconnects of 110 nm width is observed. Elemental distribution in three dimensions will be presented by comparing the tomography data at different energies.



Figure(a) Cu pad under 8kev (b) Cu pad under 9.1Kev