Coherent x-ray diffraction microscopy (CXDM) is a novel technique for reconstructing a two- or three-dimensional image. After the first demonstration of CXDM by Miao et al., several applications of CXDM have been reported. CXDM has a great potential as a new technique for structural studies of metallic materials because it is not only a non-destructive method but also applicable to a sample of micrometer thickness. In the present study, the validity of CXDM for this kind of observation was demonstrated using an age-hardened aluminum alloy in practical use. Also, Cu thin line samples were fabricated on Si$_3$N$_4$ membranes towards demonstration of electromigration analyses. Coherent x-ray diffraction patterns of the metallic materials were measured at BL29XUL in SPring-8. As the result, the internal structure and the shape of the aluminum alloy particle were three-dimensionally visualized. Characteristic diffraction patterns resulting from both the shape of the Cu thin lines and the defects formed by the application of the current were observed.