

Progress of the Fabrication of Soft X-ray Phase Zone Plates at NSRL

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Soft X-ray condenser zone plate is a key condensing and dispersing element in the field of soft x-ray microscopy. The phase condenser zone plates used at the experimental station of soft x-ray microscopy, NSRL (National Synchrotron Radiation Laboratory, Hefei, China) are fabricated. The zone-plate is operated at wavelength between 3.2nm, whose diameter is 2.8mm. The width of its outermost zone is 647nm. The zone plate material is Ge or Ni. The phase zone plate with substrate of Si_3N_4 substrate is fabricated using an x-ray lithographic process and an ion beam etching process or a reactive ion etching process. The zone plate mask is fabricated using holography-ion beam etching and is a condenser amplitude zone plates with polyimide substrate. Zone plates are used under the conditions of high radiation. To overcome the degradation of polyimide by x-ray radiation, we substitute Si_3N_4 for polyimide as zone plate substrate. The x-ray lithography is performed at the x-ray lithography experimental station of NSRL. The optical characteristics of phase zone plates are measured at the soft x-ray microscopy experimental station of NSRL.

Key Words: soft x-ray, condenser zone plate, phase zone plate, fabrication, x-ray microscopy