Deep Multilayer Gratings with Adjustable Bandpass for XRF Spectroscopy and Monochromatization

V. V. Martynov and Yu. Platonov

Osmic Inc., 1788 Northwood drive, Troy, MI 48084

In many x-ray experiments an optimum between the photon flux and spectral resolution is needed. In hard x-rays (above 2 keV photon energy), crystal monochromators and spectrometers in some cases have too high resolving power, ~ $10^4$, and cut out useful flux, making measurement time longer. In the soft x-ray region, 50eV – 2 keV, the monochromators and spectrometers on gratings have good resolution but low diffraction efficiency. Multilayer mirrors can improve the efficiency in soft x-ray region, but they still have low resolving power ~$10^2$ in both soft and hard x-ray ranges, which is often not enough to resolve close spectral lines. Some large d-spacing crystals have good resolution and good reflectivity, but they are very unstable under radiation, heat, moisture, and other environmental factors.

In this paper we propose Deep Multilayer Gratings (DMG) with adjustable bandpass as alternative dispersing elements for XRF spectroscopy and monochromatization in soft and hard x-ray region. In hard x-rays, the DMG can cover the gap between crystals and ordinary multilayer mirrors in terms of spectral resolution. In soft x-rays, they enhance efficiency in comparing with ordinary gratings and stability as compared to large d-spacing crystals [1-3]. The resolution is adjustable to the requirements for a particular experiment and can be designed to maximize the photon flux for a desired spectral resolution.

References


Submitting author: V. V. Martynov, e-mail: martynov@osmic.com