Contribution ID: **40** Type: **not specified**

HOPG and Graphite optics as high efficient "Bragg filter"and dispersive element in X-ray spectroscopy

Monday, 16 June 2025 16:40 (20 minutes)

Highly Oriented Pyrolytic Graphite (HOPG) is a crystal of particularly high reflectivity. Being a mosaic crystal, it reflects a relatively wide energy window, since it provides crystallites located at the Bragg angle for a relatively wide range of wavelengths. Further efficiency gains can be achieved through mosaic focusing (parafocusing) in the image plane and focusing geometry of graphite optics based on flexible thin HOPG and HAPG (Highly Annealed Pyrolytic Graphite) crystals. The optics was developed and are offered on the market exclusively by Optigraph GmbH, Germany.
Graphite optics is particularly useful for detecting weak spectral lines of interest in the presents of intense matrix lines or background. Graphite optics can act as a filter to extract the required energy widow in front of another energy or wavelength dispersive detector, as well as it can serve as a wavelength dispersive element itself.
Resolution of Graphite Optics can be enhanced by using a crystal in von Hamos geometry. Availability of the optics made as of full figure of revolution significantly increase the acceptance angle in von Hamos geometry and make it possible to transfer methods that traditionally require a synchrotron radiation source to a laboratory setup with an X-ray tube as a source
Reducing of the crystal thickness and mosaicity also improves noticeably the optics resolution. HAPG optics with mosaic spread of 0.1 degree can provide resolution of $E/\Delta E$ up to 4000. The trade-off between efficiency loss and resolution improvement requires optimizing the optics parameters to each specific task and setup.
The unique radiation stability and thermal conductivity of graphite crystal allow it to be used under increased thermal and radiation loads where characteristics of other crystals crucially degrade.
Some examples of graphite optics applications developed by our customers for X-rays fluorescent analysis (XFA), X-rays emission and absorption spectroscopy (XES and XAS) , extended X-ray absorption fine structure spectroscopy (EXAFS) and plasma analysis are given.

Primary author: GRIGOREVA, Inna (Optigraph GmbH)

Co-author: GUDI, Gennadi

Presenter: GRIGOREVA, Inna (Optigraph GmbH)

Session Classification: Instrumentation