

An Epifluorescence Module for Synchrotron X-ray Fluorescence Microprobe

Beamline: X26A

Technique: X-ray
Fluorescence Microprobe

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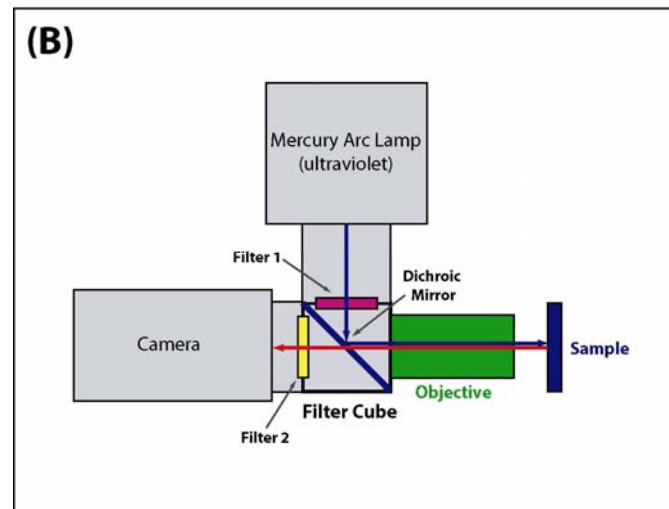
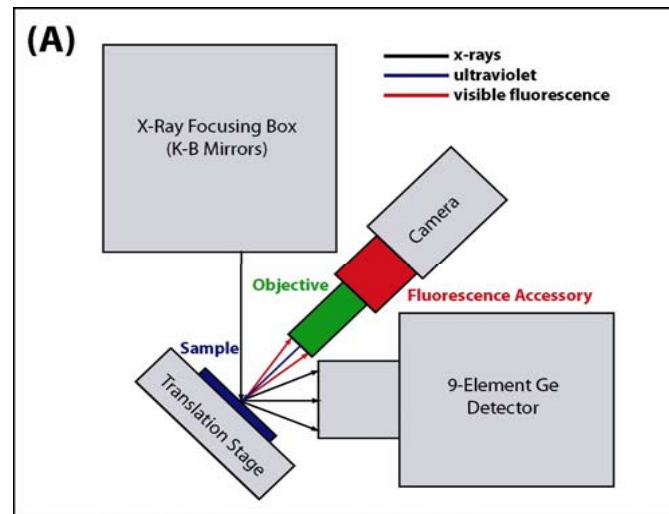
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Motivation

X-ray fluorescence microprobe (XRF) is an extremely sensitive technique for determining trace element composition. In many cases, ultraviolet or visible fluorescence illumination is beneficial in identifying the region of interest for XRF. To date, combining the XRF microprobe with ultraviolet/visible fluorescence has involved analysis with two separate microscopes. An epifluorescence microscope would be used to identify the regions of interest and then the sample is transferred to the x-ray microscope. The regions of interest are re-identified with photographs or fiducial markers with a correlation of a few microns. Here we designed an epifluorescence module that has been incorporated into the x-ray fluorescence microscope.

Results

To perform epifluorescence microscopy with the X26A beamline configuration, an epifluorescence module was designed and mounted between the light microscope objective and the CCD camera. Several samples were then analyzed with this setup using a wideband green fluorescence cube (excitation: 695, emission: 520 nm). In the first example, fluorochrome labels were used to identify Alzheimer's plaques in sections of human brain tissue, and XRF revealed co-localization of copper and zinc with the plaques. In the second example the XRF was used to identify the source of natural fluorescence in a mineral sample. Areas of the mineral that fluoresced green were found to contain calcium, zinc and iron.



(A) Layout for the x-ray microprobe at NSLS beamline X26A showing insertion of the epifluorescence module.
(B) Side view of the fluorescence module configuration.