

# Angular distribution of a characteristic x-ray emission transmitted by a periodic multilayer

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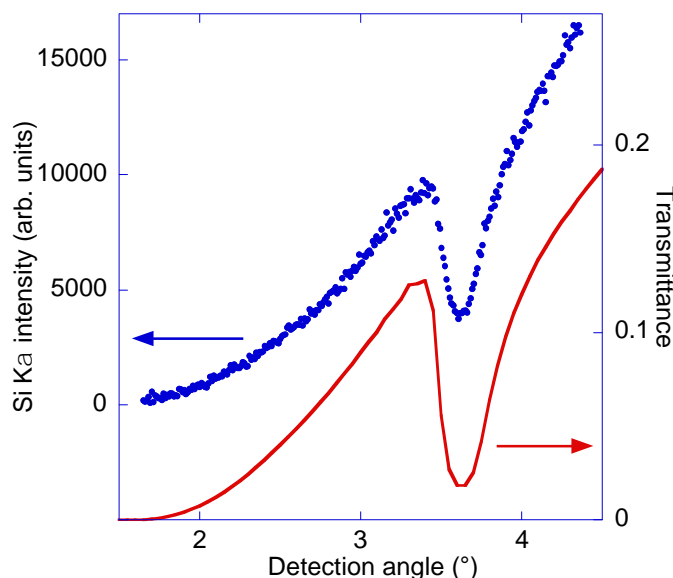
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About 20 years ago, André<sup>1</sup> suggested to use a multilayer interferential transmission mirror as a soft x-ray fluorescence spectrometer by placing the multilayer between a sample emitting some characteristic radiation to be analyzed and an x-ray detector. In the transmittance curve of the multilayer measured as a function of the detection angle, the presence of a dip indicates the occurrence of a fluorescence emission. From the Bragg law the fluorescence wavelength can be determined allowing the identification of the chemical element.



**Figure 1:** measured and calculated angular distribution of the transmittance of a  $[\text{B}_4\text{C}/\text{Pd}/\text{B}_4\text{C}/\text{Y}]_{\times 20}$  multilayer at the wavelength of the Si  $\text{K}\alpha$  emission from the Si substrate.

The dip in the angular distribution of the Si  $\text{K}\alpha$  characteristic emission, originating from the substrate and transmitted through the  $\text{B}_4\text{C}/\text{Pd}/\text{B}_4\text{C}/\text{Y}$  periodic multilayer, is clearly observed in Figure 1. It is well in agreement with simulation. The emission is induced upon proton irradiation through the multilayer and detected with an energy-sensitive CCD camera. Such a device can be envisaged as a spectrometer without mechanical displacement and using various ionizing sources (electrons, x-rays, ions).

<sup>1</sup> J.-M. André, Rev. Sci. Instrum. **69**, 1267 (1998)