Biomedical and agricultural applications of energy dispersive X-ray spectroscopy in electron microscopy.

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Abstract

Energy dispersive X-ray spectroscopy (EDS) in electron microscopy has been widely used in many research areas since it provides precise information on the chemical composition of subcellular structures that may be correlated with their high resolution images. In EDS the characteristic X-rays typical of each element are analyzed and the new detectors - an example of which we describe - allow for setting precisely the area of measurements and acquiring signals as a point analysis, as a linescan or in the image format of the desired area. Mapping of the elements requires stringent methods of sample preparation to prevent redistribution/loss of the elements as well as elimination of the risk of overlapping spectra. Both qualitative and quantitative analyses may be performed at a low probe current suitable for thin biological samples. Descriptions of preparation techniques, drawbacks and precautions necessary to obtain reliable results are provided, including data on standards, effects of specimen roughness and quantification. Data on EPMA application in different fields of biomedical and agricultural studies are reviewed.

In this review we refer to recent EDS/EPMA applications in medical diagnostics, studies on air pollution and agrochemicals as well as on plant models used to monitor the environment.

Keywords : EDS; Electron microscopy; Overlapping spectra; Sample preparation; X-ray; Standards; EPMA

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