

Characterization of Gemstones by Multiple Excitation EDXRF

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The composition of the matrix of a gemstone and the concentration of trace elements are used to characterize type and origin of gemstones. The use of different excitation conditions is necessary to cover the full range of elements: soft excitation (low HV) for light elements and hard(er) excitation for medium Z and heavy elements. The use of several HV-filter-combinations also helps to identify diffraction peaks which could influence the interpretation of the spectra.

We will present analysis results using the WinFTM[®] software package capable of utilizing multiple excitation conditions. The software works completely in the background, without the need of operators to select the various excitation conditions.

The characterization of gemstones in general could be carried out by traditional X-Ray instruments with PIN-diode or SDD detectors measuring in air. Unfortunately, light element ($Z < 20$) detection is not possible in air. By means of a vacuum chamber the full element range from sodium to bismuth is covered which is of interest for the full characterization of gemstone and mineral applications.

In this paper, the trueness of the quantitative analysis is compared to independent methods such as LA-ICP-MS and by testing certified reference material.

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