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Direct analysis of light elements in aluminosilicates using a Low-Z TXRF spectrometer

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Aluminosilicates are the most abundant minerals on the earth and they are widely studied and exploited for both research and industrial purposes. Together with mineralogical and physical investigations, chemical analysis of aluminosilicates is a crucial step in their study and characterization. Due to their abundance, sample procurement is not a problem and elemental analysis is usually performed with ICP-AES, ICP-MS, EDXRF and WDXRF using 1-5 g of material. However, in some fields (i.e. ceramic archaeometry, material synthesis, catalysis, sorption studies, clays extraction from sediments and soils, etc) very few amount of samples is available and a method which can allow a reliable chemical analysis which can preserve the sample as much as possible is required. A method for the elemental analysis of clay using TXRF was already developed but light elements like Na and Mg cannot be quantified due to the limitation of commercial available spectrometers [1]. The quantification of these two elements is very important for the chemical characterization of aluminosilicates.

For this reason, in the present work, a new strategy for the analysis of light elements in aluminosilicates is presented. The study was led using a Low-Z TXRF spectrometer equipped with a Cr source (30 kV, 10 mA), an Atominstitut TXRF Standard Vacuum Chamber (1 mbar), a W/C multilayer monochromator and a SDD with an ultrathin polymer window[2]. A set of six different aluminosilicate-rock reference materials was used for calibration and other three reference materials were used for validation. Samples were prepared as suspension using Ag as internal standard. In this way, all the elements from F to Ti were detected and quantified with good accuracy (80-120%). Moreover, Fe was also quantified using Lα lines. The obtained results will be discussed on both the analytical and technological point of view, with the aim of identify the best equipment and condition for a full elemental characterization of aluminosilicates.

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[2] J. Prost, P. Wobrauschek, C. Streli, Powder Diffraction 30(2), 2015, 93-98.

PREFERENCE*: POSTER