

# MULTIELEMENTAL ANALYSIS OF TANTALUM ORES BY ICP-OES

Lucie ŠIMONÍKOVÁ<sup>1</sup>, Jan Loun<sup>2</sup>, Karel NOVOTNÝ<sup>1</sup>, Viktor KANICKÝ<sup>1</sup>

<sup>1</sup>*Department of Chemistry, Faculty of Science, Masaryk University, Kotlářská 2, 611 37 Brno, Czech Republic*

<sup>2</sup>*KYOCERA AVX Components s.r.o., Dvořákova 328, 563 01 Lanškroun, Czech Republic*

*Email of presenting author:*

The main goal of this work is to design an analytical procedure for determining the content of tantalum and niobium in ore concentrates with variable content of these elements. In nature, tantalum deposits rarely have a concentration of more than 0.05 wt. % Ta<sub>2</sub>O<sub>5</sub> (usually 0.01 - 0.04 wt.%). Primary Ta (and Nb) mineralization is mainly related to igneous rocks, so-called rare element pegmatites. Moreover, depending on the nature of the deposit the ore may contain a wide range of accompanying minerals. For the evaluation of ore from an economic point of view, the tantalum oxide content determination is the most important. Nevertheless, knowledge of the concentrations of accompanying elements, such as tin, silicon, uranium, thorium, titanium, manganese, sulfur, sodium, potassium, is crucial for choosing the technological procedure of further processing [1,2].

The following types of decompositions have been previously developed and can be found in the available literature: 1) microwave decomposition in various mineral acids; 2) alkaline melting; 3) decomposition with HF; 4) melting with Na<sub>2</sub>O<sub>2</sub>. Nevertheless, some of these decomposition methods do not reliably achieve 100% recovery, are time-consuming, the used chemicals contain also the elements of interest or there is an increased risk of contamination.

Melting with lithium borax and subsequent dissolution in a mixture of acids has been found as an optimal method for tantalum ores sample preparation with variable content of the abovementioned elements. Depending on the origin and type of the ore the contents of Ta, Nb, Sn, Si, Ti, Mn, S, Na, K and other elements were determined by ICP-OES. The optimization of the decomposition method was verified using the standard X1808 or by the samples analyzed in an accredited laboratory by the XRF method. Verification of the results by the sum to 100% was also applied.

## *References*

- [1] F. Fairbrother, Chemistry of Niobium and Tantalum. Elsevier, Amsterdam, (1967) 243 s
- [2] J.M. Fetherston, Tantalum in Western Australia. Western Australia Geological Survey, Mineral Resources Bulletin 22, (2004)162 s

## *Acknowledgements*

The work was supported by the project MUNI/A/1412/2021 of Masaryk University „Research of geological, biological and advanced synthetic materials by analytical and physico-chemical methods”.