

THE ABILITIES OF MEASURING THE CHARACTERISTICS OF NON-METALLIC REFRACTORY MATERIALS BY THE ROENTGEN-FLUORESCENT METHOD

Prof. Zavgorodniy A.D.

Ukraine Science Research Institute of Industrial Development, Ukraine, city Kharkov,
ipr@mail333.com

Introduction

In scientific researches and industry the roentgen-fluorescent method (hereinafter - RFM) of quantitative analysis of chemical composition of materials has been widely used. Its main advantage is fast-acting, combined with the simplicity of preparation of samples for analysis. The RFM for metals and metal materials has been studied quite well, but the abilities of measuring the characteristics of non-metallic refractory materials are sharply limited by the influence of several factors. This article deals with study and elimination of those ones.

Results and Interpretation

With the help of wave roentgen-fluorescent spectrometers: "ARL 9900" and "SPRUT-C", the RFM of measuring the chemical composition of the refractories clays of enterprises: "VESCO", "Druzhkovka Quarry" and alumino-silicate refractory materials, high alumina refractory products, silicon carbide refractory materials and the masses of magnesias, represented in "Calderis Refractory Solutions" (Donetsk, Ukraine) are investigated by us.

It is established with the help of research that the accuracy of measurements of the chemical composition of non-metallic compounds depends not only on factors of overlap of spectral lines, of errors of coincidence matrix (influence background), of zero drift for time, but it depends on the properties of the control (standard) samples (hereinafter - SCS), used for the calibration of calibration curves of a spectrometer. The following key factors of the SCS influence on the RFM are established by us: accuracy of the characteristics of the SCS using standard methods; time stability of the indicators of the chemical composition of the SCS; dependence of the characteristics of the SCS on the external conditions (temperature, pressure). Besides, the following factors of influence of preparation of samples should be considered: possibility to grind a test sample to the fraction less than 0,0063 mm without adding the milling parts of iron and other metals; providing uniform (by volume) fitting a test sample.

For this point in Ukraine Science Research Institute of Industrial Development (Ukraine, Kharkov) the following types of control and standard samples for the RFM – for refractories clays: *SZP ARL9900-01*, *SZP ARL9900-03*, *CZP ARL9900-12*, *SZP ARL9900-16*, *KZ-41140*, *KZ-930134*, and for other refractory materials: *KZ-022Mg*, *KZ-025Mg*, *KZ-023AL*, *KZ-024L*, *KZ-024T* have been made, investigated (for 3 years) and approved by us. The use of these types of the SCS and other influencing factors has been realised by us in the following procedures of measuring of the content of weight of Al_2O_3 , SiO_2 , TiO_2 , Fe_2O_3 , MgO , CaO , K_2O , Na_2O :

“MVI - 26.2 - 00282049 -01”, “MVI - 26.2 - 25341601-022-001”, “MVI -26.2-25341601-023-002”, “MVI 26.2-25341601-024-003”.

The methods allow the RFM to measure the chemical composition of refractory materials in the following ranges, in %: Al_2O_3 28-90, SiO_2 5-80, TiO_2 0,5-3, Fe_2O_3 0,3-10, MgO 50-95, CaO 0-1, K_2O 1-2, Na_2O 0,2-1. Thus, a standard uncertainty of measurement of the type “A” of characteristics of the SCS is, in absolute %: Al_2O_3 0,1-0,7, SiO_2 0,1-0,5, TiO_2 0,01, Fe_2O_3 0,01-0,2, MgO 0,4-0,6, CaO 0,01, K_2O 0,02, Na_2O 0,02.

In our opinion, the possibilities of using the RFM are not exhausted with this point. The further improve of the accuracy of measurement is possible by the development of particularly stable reference control samples, and the most important thing is that it is necessary to approximate the values of the SCS to the characteristics of a tested material.

Conclusion

As the result of the author's research the content of the main factors influencing on accuracy of measurement of the RFM of the chemical composition of refractory non-metallic materials is described; the possibilities of accuracy characteristics of the RFM using the specific SCS are represented; the types of the SCS and the working methods of measuring of the RFM for refractory products are proposed.