Determination of the content of the glass phase in silica refractories

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Silica refractories are traditional materials that are indispensable in certain industrial applications (e.g. coke ovens, glass melter roofs and hot blast stoves) but also potential candidates for new applications, e.g. in the context of high-temperature thermal energy storage [1]. Since CaO is added during production as a sintering aid (flux), silica refractories should contain certain amounts of glass phase, but there is no agreement in the literature concerning the estimation of its quantity [2]. This is an important issue, because the glass phase content and composition affect the thermomechanical properties and high-temperature behavior of silica refractories, and high creep resistance is reported to be one of the major advantages of silica refractories.

Our contribution intends to present correct and reliable estimates of this glass phase content using X-ray powder diffraction (XRPD). The influence of X-ray wavelength, X-ray optics (Soller slits), choice of the internal standard, correct determination of crystalline phases present and the Rietveld refinement workflow are discussed [2]. It will be shown that with accurate XRPD estimates of the glass phase content, a comparison with X-ray fluorescence analysis yields realistic estimates of the glass phase composition, which can be used to estimate the glass phase density [2] and other glass phase properties, the former being needed to transform weight fractions into volume fractions and the latter for estimating effective elastic and thermal properties [1, 3].

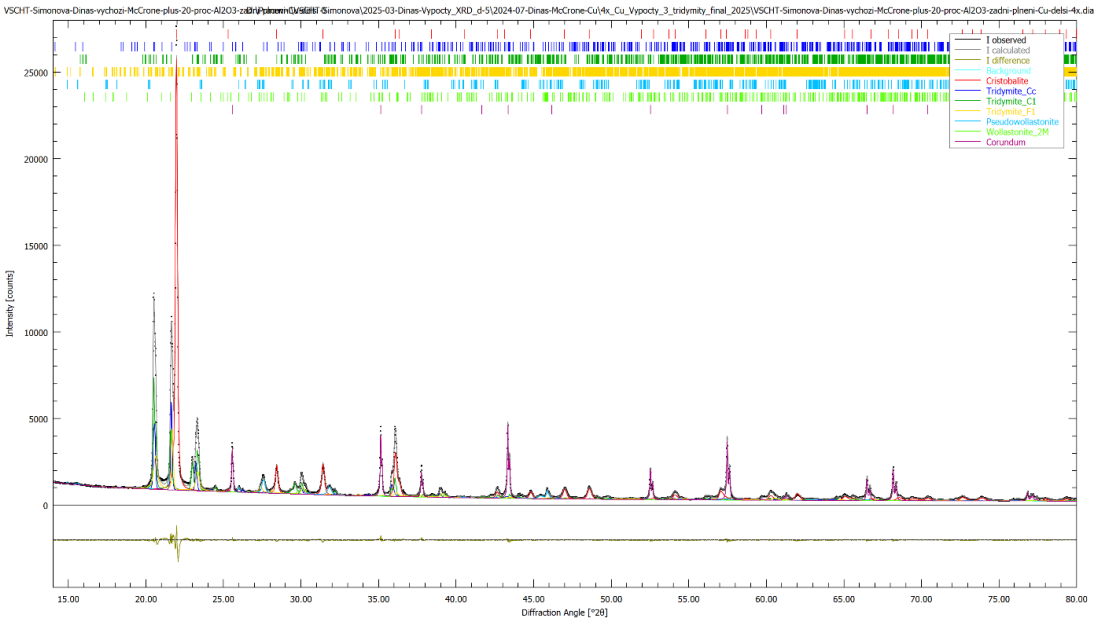


Figure 1. *Example of a Rietveld fit of the silica refractory sample spiked with corundum internal standard*

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[2] P. Špringer Šimonová, P. Bezdička and W. Pabst, J. Eur. Ceram. Soc. 46, 118235 (2026).
[3] L. Kotrbová, T. Uhlířová, W. Pabst, J. Hubálková, M. Kotouček, Open Ceram. 21, 100735 (2025).

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