MS14-P127 - LATE | DOES THE IOTA-ALUMINA PHASE EXIST?

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Several authors (e.g., [1,2,3]) reported on the synthesis of a pure alumina, designated iota-alumina (ι-Al_2O_3), with a mullite-like X-ray diffraction pattern. Formally, this would be the aluminium-endmember of the mullite compositional series $Al_2[Al_{2+x}Si_{2-x}]O_{10-x}$ with $x = 1$. However, none of the authors presented a crystal-structure model of this phase. So the existence of the iota-alumina is still not confirmed. To elucidate this question, we reproduced the synthesis procedure proposed by Ebadzadeh & Sharifi [3] and examined the synthesis products by X-ray powder diffraction and electron-dispersive X-ray spectroscopy (EDX).

The powder pattern of the synthesised material corresponds to the X-ray powder data provided by [3], but Rietveld analysis showed that the resulting phase is Na-aluminate mullite (see [4]) with lattice parameters: a = 7.6776(4) Å, b = 7.6762(3) Å, and c = 2.9163(1) Å. This aluminate exhibits a mullite-type crystal structure with a pseudotetragonal metric and Na being located at the oxygen vacancy sites. The presence of sodium could be unambiguously identified by EDX. Also in other synthesis routes of putative ι-Al_2O_3 described in the literature, sodium can be found in the starting materials. We therefore assume that in most of the cases compounds denominated as iota-alumina actually correspond to Na-aluminate mullite. Thus, the existence of this hypothetical endmember needs to be revaluated.

[1] Foster, P.A. *J. Electrochem. Soc.*, 106, 1959
[2] Perrotta, A.J. & Young, J.E. *J. Am. Ceram. Soc.*, 57, 1974
[3] Ebadzadeh,T. & Sharifi, L. *J. Am. Ceram. Soc.*, 91, 2008
[4] Fischer, R.X., Schmücker, M., Angerer, P., & Schneider, H. *Am. Min.*, 86, 2001