# INSIGHTS INTO THE STABILISATION MECHANISM OF δ-$Bi_2$ $O_3$-LIKE PHASE TO LOW TEMPERATURE BY CONFINEMENT OF NANOGRAINS IN GLASSY MATRIX

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δ-$Bi_2O_3$ is a candidate material for oxide ion conducting membranes in intermediate-temperature fuel cells. This phase is, however, stable only in the high-temperature range (>730 °C). We observed the confinement of δ-like nanograins in an amorphous matrix down to room temperature [1]. There are a few working hypotheses to explain this phenomenon:

- stabilisation due to the nanometric size of grains and the influence of the surrounding glassy matrix,
- incorporation of glass-forming dopants into the crystal structure,
- formation of non-stoichiometric $Bi_2O_{4-x}$ by $Bi^{5+}$ ions.

The studied materials are based on the ternary bismuthate glassy system $Bi_2O_3$-$Al_2O_3$-$SiO_2$ [2-3]. Crystallisation of the glass has been studied by in situ high-temperature XRD. We investigated local atomic composition using TEM and EDS measurements. In combination with MAS NMR studies, it gave a consistent view of the location of the Si and Al dopants. XANES studies of the Bi $L_3$ absorption edge were carried out to determine whether $Bi^{5+}$ ions are present in the material, which can be an alternative explanation for the stabilisation of the fluorite-type phase. In this work, I will present our current view on the subject, which was recently published in Ceramics International [4].

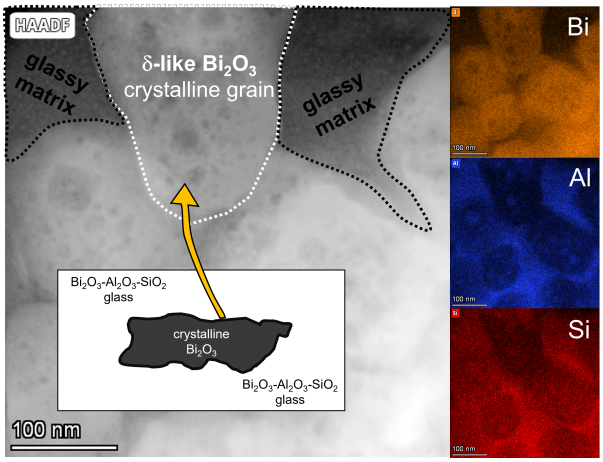


**Fig. 1.** A TEM image (HAADF mode) of a powdered glass-ceramics sample under study, together with elemental maps of Bi, O, Al, and Si (EDS). The inset shows schematically the microstructure of the sample.

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