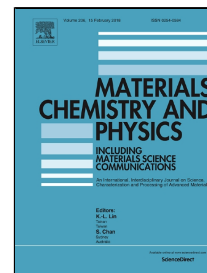


Accepted Manuscript

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PII: S0254-0584(18)30015-4

DOI: 10.1016/j.matchemphys.2018.01.016

Reference: MAC 20288

To appear in: *Materials Chemistry and Physics*

Received Date: 16 August 2016

Revised Date: 10 December 2017

Accepted Date: 06 January 2018

Please cite this article as: Sabrina Seidel, Christian Patzig, Michael Krause, Thomas Höche, Antje Gawronski, Yongfeng Hu, Christian Rüssel, The Effect of CeO_2 on the Crystallization of $\text{MgO-Al}_2\text{O}_3\text{-SiO}_2\text{-ZrO}_2$ Glass, *Materials Chemistry and Physics* (2018), doi: 10.1016/j.matchemphys.2018.01.016

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The Effect of CeO₂ on the Crystallization of MgO-Al₂O₃-SiO₂-ZrO₂ Glass

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Abstract

Glasses with the mol% composition of 21.2MgO·21.2Al₂O₃·51.9 SiO₂·5.7 ZrO₂ were doped with 0.5 mol% CeO₂ and analysed concerning their crystal phases and microstructure after a one- as well as a two-step crystallization treatment. X-ray diffraction studies indicate the presence of tetragonal ZrO₂, a high-/low-quartz solid solution and spinel which were also obtained in the glass-ceramics without CeO₂ and are essential for the good mechanical properties of the glass-ceramics. However, the X-ray diffraction results show an increase of the concentration of the desired crystal phases low-quartz solid solution and spinel with the addition of CeO₂ to the glass composition. As shown by X-ray absorption near edge spectroscopy and optical spectroscopy, Ce occurs mainly in the valence state +3. Only a very small concentration of Ce⁴⁺ exists, which probably leads to the slight yellow or beige colour observed in the samples.

Keywords: glasses; crystallization; STEM; XANES; microstructure; optical properties.

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