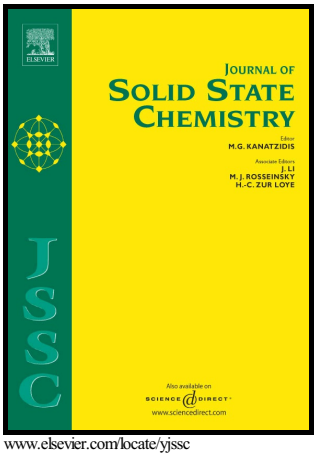

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Point defect disorder in high-temperature solution grown $Sr_6Tb_{0.94}Fe_{1.06}(BO_3)_6$ single crystals

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Abstract

New $Sr_6Tb_{0.94}Fe_{1.06}(BO_3)_6$ single crystals were obtained from lithium borate high-temperature solution growth under controlled atmosphere. Their average crystal structure was found to adopt the trigonal R-3 space group with lattice parameters a=12.2164 Å and c=9.1934 Å. A combined multiscale characterization approach, involving diffuse reflectance, X-ray photoelectron (XPS) and Mössbauer spectroscopies, was undertaken to establish the exact nature of the point defect disorder in this crystal structure. The $Fe_{Tb}^{\times}$ antisite disorder in the $Sr_6Tb_{0.94}Fe_{1.06}(BO_3)_6$ single crystals is different from the kind of point defect disorder known to exist in the powder phase material counterpart. The absence of Tb^{4+} cations in the crystal lattice was established by XPS, and that of any phase transition down to 4 K was checked by specific heat measurements. The magnetic susceptibility curve was found to follow a Curie-Weiss behaviour in the 4-354 K temperature range.

Graphical abstract