

Local structure of Er³⁺ and Yb³⁺ in oxyfluoride borate glasses studied by EXAFS

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Up to now there was a great effort in the search for new materials with improved up-conversion properties as a way of improvement solar cells efficiency. Transparent glass ceramics are promising materials for that purpose. Generally, these materials are doped with rare earth elements to produce the up conversion process. Silica glass ceramics are well studied systems; on the other hand few reports exist about the use of borate glasses. Here, we report the erbium and ytterbium environments using x-ray-absorption fine-structure spectroscopy (EXAFS) on the Er and Yb LIII edge in borate glasses, with nominal composition 28,5 MO-57,0B₂O₃-9,5NaF-3,75YbF₃-1.25ErF₃ and 29,7 BaO-59,4B₂O₃-9,9NaF-0,75YbF₃-0.25ErF₃ (% in mol) where M: Ca, Sr, Ba. Crystallized samples were also investigated. The average Er-F bond separation was found to vary slightly near 2.27 Å meanwhile the Yb-F separation vary near 2.3 Å. Similar results were found for glass ceramics. The implications of these results in understanding structure-property relationships in borate glass and glass ceramics will be discussed.

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