Zone refining of $LiGd_{0.5}Lu_{0.5}F_4$

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Doped crystals with high neodymium concentrations present important optics properties for the attainment of ultrashort laser pulses. Thus, in this work it was studied the melting behavior of the $LiGd_{0.5}Lu_{0.5}F_4$ solid solution by zone refining technique. Since previous DTA results showed that this material presents a melting behavior near the congruence and it is a promising host for Nd doping. The charge was synthesized from the respective fluorides under a flux of HF and Argon; afterward it was submitted to one melting cycle in a zone refining system. The hot zone was dislocated with a rate of 2,5mm/h, and a HF atmosphere was maintained during this process. The physical characterization of the ingot was made using differential thermal analysis, electronic scanning microscopy, energy dispersive spectrometry and by X-ray diffraction. It was observed in the first part of the ingot that besides the segregation of the gadolinium there was a precipitation of the compound $Gd_{0.75}Lu_{0.25}F_3$. In the middle a stoichiometric compound has formed and LiF, resulted from the initial instability, was segregated in the end of the ingot. Gd concentration data measured by EDS, as well as the calculated lattice parameters from the X-ray diffraction patterns for diverse regions of the ingot, show that it has the segregation of the Gd^{3+} ion toward the end of the bar. The study of some samples extracted from the stoichiometric part will be carried out in order to verify undesirable variations of composition in this region, since the zone refining technique would become inadequate to purify this material.