Study of $BaLiF_3$ single crystal fiber growth by micro-pulling-down method

Jair R. de Moraes, Fernando R. da Silva, Sonia L. Baldochi
IPEN-CNEN/SP, CP 11049, 05422-970, São Paulo, SP, Brazil

The growth of regular in diameter single crystal fibers, without macro and microscopical defects, requires an accurate knowledge of the experimental parameters that influences the crystallization conditions. The purpose of this work was the study of $BaLiF_3$ (BLF) fibers grown by the micro-pulling down (μ-*PD*) method in resistive and inductive mode. The fibers were pulled from a platinum crucible with a micro-capilar of diameter 0.8 mm. The starting material was BLF crystals obtained by zone melting. Once this compound present incongruent melting behavior the initial charge was LiF enriched (5 or 7 mol%). The growth was performed under flow of argon (100%), CF_4 (100%) and a mixed flow of Ar plus CF_4. A *LiF* fiber was used as seed. The fiber characterization was performed by optical microscopy. In the resistive system the distance between main-heater and after-heater was optimized to get an ideal growth condition. This adjustment is related to the temperature gradient in the solid-liquid interface. For both modes, in order to obtain a stable meniscus it was necessary a carefully control of the pulling rate. Homogeneous and transparent BLF fibres were obtained only for a pulling rate limited to 0.12mm/min. Furthermore, the atmosphere control was important to avoid impurity contamination from moisture and oxygen, preserving chemical composition and optical quality. The growth under atmosphere or flow of argon (100%) reveals itself as a good condition if a previous vacuum treatment ($4x10^{-2}$ torr) is carried out. (This work was supported by CNPq/PIBIC and FAPESP).