

Development of Single Crystals for Applications in Nuclear Radiation Detection

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Abstract

Single crystals of technologically important materials are grown in the Crystal Technology Section of the Technical Physics Division, BARC. These crystals find applications as scintillators and dosimeters in nuclear radiation detection and measurements. Recent development of some of the advanced scintillators like $\text{Gd}_3\text{Ga}_3\text{Al}_2\text{O}_{12}:\text{Ce}$, and $\text{Lu}_2\text{SiO}_5:\text{Ce}$ and conventional ones like CsI:Tl and $\text{YAlO}_3:\text{Ce}$, etc useful for gamma-ray spectroscopy will be discussed. Development of solid state detectors based on single crystal of materials containing Li^6 and B^{10} that have large capture cross-sections for neutrons will be described. In particular, single crystals of cerium doped $\text{Li}_6\text{Y}(\text{BO}_3)_3$ and silver/copper doped $\text{Li}_2\text{B}_4\text{O}_7$ have been grown and characterized. Optical, thermo-luminescence, photo-luminescence and scintillation properties of these crystals have been investigated with a view to develop devices for applications in nuclear radiation detection. The growth of single crystals from melts, recent efforts in the development of compact and portable detector set-ups for gamma-ray spectroscopy and detection thermal neutrons will be described in the talk.