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Precursors preparation for growth of low-background scintillation crystals

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Precursors play important role in obtaining crystals with preassigned functional properties. Impurities in precursors significantly influence optical properties, radiation hardness and light output of scintillating crystals, concentration of impurities directly correlates with radioactive background of scintillating crystals. As an example, during BGO growth the methods of purification and synthesis of were shown to influence optical and scintillation properties of grown crystals as well as their radiation hardness. Radiation-hard BGO crystals were obtained when using complex approach to synthesis and purification of bismuth oxide. First stage was pyrometallurgical processing with removal of lead and other active impurities (e.g. iron). Second stage was vacuum distillation of Bi and direct oxidation. In cases when low-background crystals are required third stage of polonium removal by processing with metallic sodium is added. Such specially prepared precursors procure the highest quality of grown crystals.
A goal of obtaining crystals for rare events registration is an even more unique task. From one side, crystals with the best scintillating properties are required. From the other, own radioactive background, especially in a certain range of elements, should be extremely low.
In our presentation we will talk about approaches and methods of purification and synthesis of MoO3, Li2CO3 and Na2CO3 and recuperation of MoO3 from residuals after crystal growth and crystal processing. We will discuss the questions about methods'efficiency and achieved results in impurities concentrations. Results of ZnWO4, ZnMoO4, Li2MoO4, Na2Mo2O7 crystal growth and their scintillation properties, including own radioactive background, will be presented.

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