

Industrial development of fast scintillator materials

Wednesday 20 September 2017 10:29 (1 minute)

S. Sykorovaa, S.Valkovaa, R. Kucerkovab, J. Houzvickaa, M. Niklb

a Crytur Ltd., Palackého 175, Turnov, 511 01, Czech Republic

b Institute of Physics AS CR, Cukrovarnická 10, Prague 6, 162 00, Czech Republic

In the recent years, the demand for faster scintillators increased significantly in many areas of research in nuclear and particle physics, in medicine and industry.

Crytur company is actively participating in R&D of novel faster single crystal scintillator materials for both the research and industrial applications.

For some of high energy physics applications the existing materials like PbWO₄ (PWO) with very fast (less than 10ns) scintillation response, but very poor light yield, are still preferred. As industrial availability of this material disappeared, Crytur established after two years of intense R&D, a novel and reliable growth technology to prepare PWO single crystals for PANDA experiment at GSI in Germany.

The traditional materials like Yttrium/Lutetium Aluminum Garnets doped with Ce³⁺ (Y₃Al₅O₁₂:Ce, Lu₃Al₅O₁₂:Ce) with the leading scintillation decay time of 60-80 ns are excellent candidates for high energy physics applications regarding the radiation hardness but their scintillation response is not fast enough.

For the development of novel faster materials there are several mechanisms which can be considered. One of them is based on nonradiative energy transfer from the excited luminescent centers. Such a process can be induced by co-doping of YAG/LuAG:Ce(Pr) with an element from the group of lanthanides (Nd, Sm, Eu, Tb, Dy, Ho, Er).

As a working example, Crytur has prepared recently a codoped LuAG:Pr single crystals: this material shows a faster response with 40% shorter decay time of the dominant component comparing with the non-codoped material. It is robust and temperature resistant, with a moderate light yield.

In this contribution, we will present the results of the industrial growth of PWO using the newly established growth technology in Crytur. Furthermore, the development of novel faster garnet scintillators based on co-doping with lanthanides and their scintillation properties in terms of light yield and decay time at room temperature will be presented as well.

Has accepted

Authors: Ms SYKOROVA, Silvia (Crytur Ltd.); Ms VALKOVA, Silviya (Crytur Ltd.); HOUZVICKA, Jindrich (CRYTUR); Ms KUCERKOVA, Romana (Institute of Physics AS CR); NIKL, Martin (Elementary Particle Division)

Presenter: Ms SYKOROVA, Silvia (Crytur Ltd.)

Session Classification: Poster Session 2

Track Classification: P2_crystalgrowth