ST 5: Strahlendetektoren

Time: Tuesday 9:30–10:00 Location: Ch 12.0.16

ST 5.1 Tue 9:30 Ch 12.0.16

Nanocrystalline Glass Ceramics for Radiation Imaging — •Graham Appleby[1], Andy Edgar[2], and Grant Williams[3] — [1]Institute of Materials Science, Technische Universität Darmstadt, Darmstadt, Germany — [2]MacDiarmid Institute, Victoria University of Wellington, New Zealand — [3]Industrial Research Limited, Wellington, New Zealand

Commercial solid state detectors of radiation such as x-rays, gamma rays and neutrons are often based on scintillator screens or imaging plates which consist of a crystalline luminescent material suspended within a supporting layer. For example, x-ray imaging plates consist of micron-sized crystallites of the storage phosphor BaFBr:Eu^{2+} within a polymer layer.

The main limitation of such materials is the poor spatial resolution of the images obtained, which arises from light scattering from the crystal grains. To overcome this problem, new detectors are under development in which nanocrystallites of a luminescent material are grown within a glass matrix. The transparent nature of these glass-ceramics leads to a reduction in light scattering and therefore improved spatial resolution.

Nanocrystallites of the storage phosphor $BaCl_2$:Eu^{2+} have been successfully incorporated into fluorozirconate glasses for x-ray imaging plates, and into neutron sensitive lithium borate glasses for thermal neutron imaging plates. An overview of the structural and radiation imaging characteristics of these materials will be given in this presentation.

ST 5.2 Tue 9:45 Ch 12.0.16

Photostimulated luminescence sensitivity enhancement of the storage phosphor CsBr:Eu^{2+} by thermal treatment in oxygen — •Jörg Zimmermann, Sabine Hesse, and Heinz von Seggern — Institute of Materials Science, Electronic Materials Division, Petersenstrasse 23, 64287 Darmstadt, Germany

Nowadays image plates (IP) are widely used for 2D detection of x-rays in medicine and materials research. Commercial IPs consist of a powder of the storage phosphor BaFBr:Eu^{2+} mixed with a polymer binder on a polymer substrate. The spatial resolution of those plates is limited by light scattering introduced by the difference of refractive index of binder and phosphor grains. For IPs with higher spatial resolution and comparable photostimulated luminescence (PSL) sensitivity the X-ray storage phosphor CsBr:Eu^{2+} is a promising material since it can be grown spicular on a glass substrate using evaporation techniques. The higher resolution of those NIPs (needle image plates) thereby is achieved by a light guiding effect resulting from the thin needles exhibiting diameters in the ten-micrometer scale. It will be demonstrated that the introduction of oxygen enhances the sensitivity of this storage phosphor. The influence of thermal treatment in oxygen containing atmosphere is investigated by means of various spectroscopic methods. A possible mechanism for the influence of oxygen in CsBr:Eu^{2+} on its optical properties will be discussed.