



17 KONGRES POLSKIEGO  
TOWARZYSTWA FIZYKI  
MEDYCZNEJ

30.09 - 02.10.2022 W KRAKOWIE

Contribution ID: 111

Type: **Prezentacja ustna**

## Development of composite TL and OSL materials for analyzation of dose and energy of photons beam for radiotherapeutic applications

*Sunday 2 October 2022 08:45 (15 minutes)*

Thermally stimulated (TSL) and optically stimulated (OSL) luminescent dosimetry are a versatile tools for the assessment of ionizing radiation dose.

For control of photon beam dose distributions in radiotherapy, we used the non-conventional TSL detectors with 10/100.5mm size prepared from the Czochralski grown crystals of Ce<sup>3+</sup> doped garnets with different density  $\rho$  and effective atomic number  $Z_{eff}$ : "light" Y<sub>3</sub>Al<sub>5</sub>O<sub>12</sub>:Ce (YAG:Ce);  $\rho=4.5\text{g/cm}^3$ ;  $Z_{eff}=35$ , and "heavy" Lu<sub>3</sub>Al<sub>5</sub>O<sub>12</sub>:Ce (LuAG:Ce);  $\rho=6.7\text{g/cm}^3$ ;  $Z_{eff}=61$  and Gd<sub>3</sub>Al<sub>3</sub>Ga<sub>3</sub>O<sub>12</sub> (GAGG:Ce),  $\rho=6.6\text{g/cm}^3$ ;  $Z_{eff}=54$ . The detectors were irradiated with 6MV and 15MV X Rays using linear accelerator Clinac 2300C/D from Varian Medical Systems at Oncology Center in Bydgoszcz.

We have found that YAG:Ce crystals is suitable TSL material for application with 6MV photon beams due to high intensity TSL response at typical therapeutic dose of 2 Gy and good position of main TSL peak at 290K[2]. However, for at the registration of X rays with the high energy (15 MV), much heavy LuAG:Ce and GAGG:Ce TSL detectors can be applied. Furthermore, the creation of multilayered composite TSL detectors based on the YAG:Ce film and LuAG:Ce/or GAGG:Ce crystals were considered using LPE growth method [3]. Another approach in the development of the composite detectors is connected with efficient OSL properties of GAGG:Ce[4] and YAG:Ce crystals [5]. The creation of YAG:Ce/GAGG:Ce composite OSL detectors can be even more prospective than their TSL counterparts. Similarly to composite scintillators [6], the registration of the signal coming from film and crystal parts of composite detector can be realized using differences in their OSL decay kinetic.

### Sesja

Radioterapia

**Authors:** WINIECKI, Janusz (Centrum Onkologii w Bydgoszczy); Prof. ZORENKO, Yuriy (Kazimierz Wielki University in Bydgoszcz); Ms MICHALSKA, Paulina; Dr WITKIEWICZ-LUKASZEK, Witkiewicz

**Presenter:** Prof. ZORENKO, Yuriy (Kazimierz Wielki University in Bydgoszcz)

**Session Classification:** Radioterapia

**Track Classification:** Radioterapia