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ABSTRACT BOOK

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Development of X-ray sensitive hybrid organic-inorganic systems utilizing tungstate nanoparticles for radiation detection applications

Pudzs Kaspars[1,*], Pudza Inga[1], Tokmakovs Andrejs [1], Kalinko Aleksander[1], Kuzmin Alexei [1]

[1] *Institute of Solid State Physics, University of Latvia*

E-mail: kaspars.pudzs@cfi.lu.lv

The active field of research currently involves the development of new radiation detectors using nanomaterials. Hybrid materials, which consist of an organic matrix combined with high-Z nanoparticles, are highly promising for radiation detection applications.

This study focuses on the development of X-ray sensitive hybrid organic-inorganic systems utilizing tungstate nanoparticles (AWO_4, where A= Ca, Zn, Sr, Cd) and a P3HT:PCBM blend. The nanoparticles were synthesized using the hydrothermal method and analyzed using X-ray diffraction and scanning electron microscopy. The X-ray detectors were composed of five layers (ITO/PEDOT:PSS/NPs:P3HT:PCBM/BPhen/Al) and operated without a bias voltage. The detectors were tested using synchrotron radiation, and the addition of high-Z element nanoparticles improved the detectors' X-ray attenuation efficiency. The high dynamic range of the fabricated detectors allowed for recording X-ray absorption spectra and performing imaging experiments.

These hybrid detectors with different tungstate nanoparticles offer a cost-effective X-ray detection solution that can be optimized for a particular energy range by selecting the A-cation element.

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References

[1] I. Pudza, K. Pudzs, A. Tokmakovs, N. R. Strautnieks, A. Kalinko, A. Kuzmin, Nanocrystalline $CaWO_4$ and $ZnWO_4$ tungstates for hybrid organic-inorganic X-ray detectors, Materials 16 (2023) 667, DOI:10.3390/ma16020667.