

Positronium lifetime measurement using J-PET Detector

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Positron Annihilation Lifetime Spectroscopy (PALS) is a great tool to study nanostructure of porous materials. Iterative computer procedure based on LT and MELT was prepared to analyze positron lifetime spectra and to extract average positronium lifetimes distribution. Specific iteration method which is based on increasing number of components fitted to spectrum in each step helped stabilize and accelerate operation of fitting program. Procedure uses ROOT software and Levenberg-Marquadt algorithm to retrieve mean lifetime distribution with additional information about dispersion of main components. Two exemplary samples, silicon plates (Si) and polyvinyl toluene (PVT) were measured in order to check analysis procedure. Nanostructural information received from PALS analysis putted into the metabolic image obtained by Positron Emission Tomography (PET) can give a quite new quality of imaging of the human body. Proposition of joining PET and PALS techniques altogether in J-PET device is briefly described.

A. Gajos, E. Czerwiński, D. Kamińska, P. Moskal, Patent: PCT/PL2015/050038

P. Moskal et al., Acta Phys.Polon. B47 (2016) 509

B. Jasińska et al., Acta Phys.Polon. B47 (2016) 453

A. Gajos et al., Nucl. Instrum. Meth. A819 (2016) 54.

D. Kamińska et al., Nukleonika 60 (2015) 729.

P. Moskal et al., Nucl. Instrum. Meth. A775 (2015) 54.

P. Moskal et al., Nucl. Instrum. Meth. A764 (2014) 317.