"Physico-Chemical nanomaterials science"

Parameterization algorithms for mixed positron-electron interaction in nanostructurized substances

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At the present, the phenomenon of electron interaction with its antiparticle (positron) known as positron-electron annihilation in lifetime (PAL) measuring mode has been employed in a number of important practical applications like those probing free-volume nanostructurization in solids [1]. Under nanostructurization, the reconstruction route of PAL spectrum involves mixed positron (e^+) and positronium Ps (bound positron-electron state) channels resulting in three-term decomposed PAL spectra. The parametrization of these channels using simple trapping models (STM) [1] has a vital consequence for nanomaterials engineering.

In this report, this problem is reconsidered for different nanostructured solids with a help of available mathematical parameterization algorithms, such as:
(i) two-term STM fully ignoring third component in the PAL spectrum,
(ii) three-term STM accepting third component as common e^+-trapping input,
(iii) two-term STM with third component inserted in a source contribution,
(iiii) two-term STM for generalized three-to-two component transition.

It is shown that intrinsic nanoscale structural inhomogeneities due to *guest* nanoparticles embedded in *host* substances can be described in terms of substitution trapping in e^+-related and Ps-related sites (e^+-to-Ps trapping conversion), allowing parameterization of interfacial free-volume voids responsible for e^+-trapping and defect-free bulk lifetime of nanostructured matrix [2,3].

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