PECULIARITIES OF POSITRON ANNIHILATIONWITH ELECTRONS IN THE VICINITY OF NANOVOIDS IN AMORPHOUS AND CRYSTALLINE TRIGLYCERIDES

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The presence of nanovoids m the structure of fatty-acid triglycerides was confirmed by means of the positron annihilation spectroscopy. The nanovoids are formed between closely packed hydrocarbon moieties of fatty acids at the boundaries of monomolecular layers. The lengths of such quasi-onedimensional nanovoids are constrained by the terminating methyl groups and their mean radius depends on transverse distances between the molecules and the lattice type. The nanovoids radius varies in the course of the crystaUine lattice ordering and during the structural relaxation of an amorphous phase. The influence of these processes on the probability of positronium annihilation within nanovoids and their radii was studied m case of hign melting triglycerides. Triglyceride samples were prepared using fractional crystallization of the milkfat solution in acetone at 20°C (1st fraction) and 13 °C (2nd fraction). Positron annihilation with electrons in the vicinity of nanovoids is shown to occur from bound electron-positron state (positronium atom, Ps) and probability S of this process is linearly decreasing with increasing nanovoid radius, r. r varies in the ranges of 0.25 - 0.53 nm and 0.20 - 0.36 nm foi the 1^{st} and for the 2nd fraction, respectively. Extrapolation of direct line S = f (r) to the intercept with abscissa provides tlie critical radius, R, of the nanovoid to the interior of which an electron can tunnel with subsequent formation of Ps. R is equal to 0.81 ± 0.02 nm for the 1^{st} fraction and 0.66 ± 0.02 nm for the 2rid one. Amorpliization does not affect the vafue of R but leads to the decrease in the slope ds/dr by 17% on average. It means that electron binding to the atoms in triglyceride molecules packed in amorphous structure is stronger compared to that m the crystalline state. On the basis of these results, the electron work function for the interior surface of nanovoid is suggested to be lower in crystalline triglycerides compared with amorphous ones.