

## Free-volume evolution in 1-propanol confined in partially filled regular mesopores of SBA-15 matrix

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1-propanol belongs to polar substances with a simple structure and significant use in synthetic, solution organic and polymer chemistry. It serves as an important prototypical polar protic organic compound in various types of condensed matter studies.

The aim of this work was to show the changes in the annihilation behavior of ortho-positronium (oPs) in 1-propanol confined in regular mesopores of the SBA-15 matrix as compared to the bulk state [1] with temperature as well as differences in its free-volume evolution at the different levels of pore filling. Since the SBA-15 matrix is a hard inorganic matrix with a polar inner surface, we anticipate the manifestations of the attractive interactions between the polar groups of 1-propanol and the SBA-15 matrix in filling the matrix mesopores as well as in the free-volume microstructure of the confined 1-propanol.

From the measured dependencies of the oPs lifetimes and their relative intensities on the filling coefficient  $k$  ( $k = M_{\text{prop}}/M_{\text{tot}}$ , where  $M_{\text{prop}}$  is the weight of propanol and  $M_{\text{tot}}$  is the weight of the matrix together with the confined propanol) is shown that the gradual filling of the mesopores with molecules of 1-propanol is most likely first by bonding the 1-propanol molecules to the inner polar surface in the thin layer and then filling the pores completely. In addition, at some significant filling coefficients, the free-volume properties of 1-propanol were measured over a wide temperature range of 15-350 K. Filling coefficients  $k=0.15$ ,  $0.24$  and  $0.35$  were chosen at which the changes in oPs lifetimes or their relative intensities occur, measured at room temperature.

[1] J. Bartoš, H. Švajdlenková, O. Šauša, M. Lukešová, D. Ehlers, M. Michl, P. Lunkenheimer and A. Loidl, *J. Phys.-Cond. Matt.* **28**, 015101 (2016)