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The variety of states of adsorbed water in heterogeneous materials and their dielectric response

Feldman Y., Puzenko A., Ishai P., Greenbaum A., Segev Y., Vasilyeva M., Gusev Y.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

Whenever water interacts with another dipolar or charged entity, there exists a broadening of its dielectric relaxation peak. Often this broadening can be described by the phenomenological Cole-Cole (CC) spectral function. A new approach has been recently presented (A. Puzenko, P. Ben Ishai, and Y. Feldman, Phys. Rev. Letters 105, 037601-4 (2010)), which is based on the fractal nature of the time set of the interaction of the relaxing water dipoles with their encompassing matrix. It demonstrates a fundamental connection between the relaxation time, τ, the broadening parameter, α, and the Kirkwood-Froehlich correlation function B. The parameters B, τ and α were chosen as the coordinates of the new 3D space, wherein the evolution of the relaxation process, as a result of the variation of external macroscopic parameters (temperature, pressure etc.), will depict a trajectory. This trajectory is a result of the connection between the kinetic and the structural properties of water in the complex system. © 2013 American Institute of Physics.

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Keywords

Adsorbed Water, Anomalous Diffusion, Cole-Cole Spectral Function, Dielectric Relaxation, Porous Glasses