

Dielectric Spectroscopy of Supercooled Water in Porous Glass and Compressed Hydrophilic Aerosils

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The dynamic properties of water dispersed in compressed aerosils and in Vycor porous glass have been investigated by means of dielectric relaxation spectroscopy. The measurements were performed in the frequency range from 10 mHz to 10 MHz and in the temperature range from 123 K to 300 K. Three relaxation processes were observed in the case of water in aerosils, while the number of processes for water in Vycor was four. In each case, two of the processes were found to originate from the defect movements of the part of the sample that had crystallized. The fastest process in each sample probably originated from the restricted mobility of the water content close to the interacting outer surface of the aerosils and inner pore surface of the Vycor porous glass. The disorder and interaction with the hydroxyl groups at the surface of the aerosils lead to the supercooling of water in the surface layers. A process with a Vogel-Fulcher-Tamman (VFT) like temperature dependence arises there. The additional slow process in the case of water in Vycor could be the relaxation of the Maxwell-Wagner-Sillars polarization.