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NMR RELAXOMETRY THEORY AND APPLICATIONS

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NMR relaxation in partially saturated pores: applications to cement materials, carbon xerogels and silica colloidal crystals

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Title

NMR relaxation in partially saturated pores: applications to cement materials, carbon xerogels and silica colloidal crystals.

Abstract

Nuclear magnetic resonance relaxation studies of liquids confined inside porous materials mostly refer to saturated pores. However, in many practical circumstances the pores are only partially saturated with liquids and this dramatically influences the NMR relaxation data. For describing the effective relaxation rate, under partially saturated conditions, a two-phase exchange model was developed. In this model it was assumed that the molecules located on the internal surface of the pores only partially participate in the exchange process, and their participation depends on liquid distribution inside pores. Thus, the model allows extracting of information about liquid morphology inside porous systems and reveals a correlation between liquid morphology and the surface affinity. The model was applied to study liquid morphology inside cement paste pores, carbon xerogels and silica colloidal crystals.

Author Biography

Ioan Ardelean received his B.S. degree in physics in 1989 and the Ph.D. degree in 1997 from "Babes-Bolyai" University of Cluj-Napoca, Romania. Since 1990 he was employed on different academic positions at Physics and Chemistry Department of the Technical University of Cluj-Napoca and in 2006 he became full professor. Between 1999 and 2001 he joined the group of Prof. Rainer Kimmich, Ulm University, Germany, as an Alexander von Humboldt fellow. His current scientific interest is related to the applications of low-field NMR techniques to study molecular dynamics under confinement conditions in porous materials.