Structure of the two-dimensional NMR-relaxation spectra of porous systems

D. Bytchenkoff[1,2] and S. Rodts[1]

[1]*Laboratoire Navier, Ecole Nationale des Ponts et Chaussée, Paris, France*
[2]*Laboratoire d'Energétique et de Mécanique Théorique et Appliquée, Université de Lorraine, Nancy, France*

ABSTRACT: The form of the two-dimensional NMR-relaxation spectra – which allow to study interstitial fluid dynamics in porous systems by correlating spin-lattice and spin-spin relaxation times – has given rise to numerous conjectures. Using the, mathematically rigorous, eigen-modes formalism and, more phenomenological, first-order two-site exchange model, we established and put to the test by computer-simulations a number of fundamental structural properties, i.e. symmetries, overall intensities, signs and relative intensities of the diagonal and cross components, of such spectra. The properties should provide useful clues for assignment and analysis of NMR-relaxation spectra of porous media. The most striking of them – the presence of negative peaks – underlines an urgent need for improvement of the current two-dimensional Inverse Laplace Transformation algorithm used for calculation of relaxation spectra from NMR raw data.