1D/2D NMR investigation of the Pyrex glass

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Abstract

The structure of the important technological glass Pyrex® was investigated by 1D- and 2D-correlation NMR techniques. The local order was first analysed by 1D 23Na, 27Al, 11B and 29Si MAS-NMR performed at 9.4 and 18.8 T. In a second step, the medium range order was documented using homo- and, for the first time, hetero- nuclear correlation NMR techniques. The presence and nature of BOB bonds were analysed using 2D 11B DQ-SQ map; the silicate speciation was probed by 2D 29Si/X (X=11B, 23Na and 27Al) D-HMQC maps and the 27Al/11B interactions were studied by TRAPDOR-NMR experiments. Altogether, the set of NMR data was used to extract accurate NMR parameters, to update the different borate site description, to distinguish different Q4 silicate units and to finally document how aluminium ions enter into the Pyrex® network.

Keywords: borosilicate, NMR, correlation, structure

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