

NMR and NQR Studies of Borate Glasses*

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Nuclear magnetic resonance (NMR) has been used for some 40 years to study atomic arrangements, chemical bonding, and structural groupings in borate glasses and crystalline compounds, and nuclear quadrupole resonance (NQR) has more recently increased the resolution and accuracy of the measurements. Examples are presented of the use of first-order and second-order quadrupolar effects in ^{11}B NMR spectra to obtain structural information, and ^{11}B and ^{10}B NQR spectra to obtain the quadrupolar parameters Q_{cc} (the coupling constant) and η (the asymmetry parameter) with accuracies of 5 or 6 significant figures, and 3 figures, respectively. Q_{cc} and η are extremely sensitive to changes in atomic rearrangements and chemical bonds, so they are excellent monitors and provide identification of bonding configurations and structural groupings in borates: Examples are also presented in which combinations of NMR and NQR data are used to extract the desired information. NQR detection of resonances at frequencies as low as 276 kHz is discussed.

Key words: NMR; NQR; Borates; Quadrupolar Interactions.

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