Abstract Submitted
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On the Elastic behavior of Sodium Borate Glasses[1] K. VIGNAROOBAN, P. BOOLCHAND, University of Cincinnati, R. KERNER, M. MICOULAUT, University of Paris — Alkali Borates are industrial glasses and their physical properties are of general interest. We have made a special effort to synthesize dry $(Na_2O)_x(B_2O_3)_{100-x}$ glasses over a wide composition range, $0 < x < 70\%$, and have examined them in modulated-DSC, Raman scattering, FTIR, and molar volume experiments. The enthalpy of relaxation at T_g shows a global minimum in the $20\% < x < 40\%$ range, which we identify with the rigid but stress-free Intermediate Phase (IP). The Boroxyl ring vibrational mode near 808 cm^{-1} in B_2O_3, steadily softens by about 4 cm^{-1} as the soda content increases to about 20%. A vibrational mode of mixed rings[2] (containing 3-fold and 4-fold B) is also observed near 775 cm^{-1} at low x, and it also steadily softens by nearly 10 cm^{-1} as x increases in the $20\% < x < 40\%$ soda range (IP). We are examining the underlying optical elasticity power-laws to ascertain the nature of the elastic phases. IR reflectance experiments provide the 4-fold coordinated B fraction to increase from 0.17 near x = 20% to 0.44 near x = 40% in broad agreement with NMR results. Evolution of physical properties of these glasses with soda content will be reviewed.

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[2]Kamitsos et al., Jour. Mol. Struct 247, 1 (1996).

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