
The Complex Raman Response of Cations in Alumino-Silicate Glasses

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Abstract

Raman scattering of ternary alumino-silicate glasses with alkali and alkaline-earth cations (M=Mg, Ca, Sr, Ba, Na,...) has been performed. The concentrations range from the peralcaline ($MO/Al_2O_3 > 1$) to the peraluminate ($MO/Al_2O_3 < 1$) domain keeping constant the silica content. The vibrational signature of the cations is clearly evidenced at low frequency in the depolarized (VH) spectra. Between one and three bands are identified. They associate to different types of motions depending on the charge carried by the cation (alkali or alkaline-earth atoms). In addition, glasses with magnesium exhibit a very peculiar behavior. Very interestingly, some bands disappear for the tectosilicate glasses ($MO/Al_2O_3=1$) and in the peraluminate domain revealing a clear vibrational contrast between network modifier cations and charge compensator cations [1]. A preliminary experiment in a quaternary alumino-silicate system combining two types of alkali atoms highlights the possibility by simple Raman spectroscopy to define the preferential role of each cation, *i.e.* network modifier or charge compensator, and to make a semi-quantitative treatment as well. [1] B. Hehlen and D. Neuville, *Raman Response of Network Modifier Cations in Alumino-Silicate Glasses*, J. Phys. Chem. B **119**, 4093 (2015).

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