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Determination of polaron hopping frequency limits in modified vanadate and lithium borovanadate glass systems from EPR line-narrowing J. MCKNIGHT, K. WHITMORE, P. BUNTON, William Jewell College, S. FELLER, D. VENNERBERG, Coe College, B. BAKER, William Jewell College, WILLIAM JEWELL COLLEGE COLLABORATION, COE COLLEGE COLLABORATION — Electron Paramagnetic Resonance (EPR) spectra of four different vanadate glass systems of varying molar ratios, R, show that the hyperfine structure lines (hfs) become more resolved and defined as R increases. For example, in the sodium oxide vanadate glass system, RNa2OV2O5, low R-values (around 0.1) result in little to no hyperfine resolution in the EPR spectra. However, as the R-value increases and approaches 0.5, the spectra significantly become more resolved, and a dramatic narrowing of the lines occurs, revealing a hyperfine coupling parameter B of order 17.7 mT, corresponding to an upper-limit polaron hopping frequency of 487 ± 20 MHz. In the model proposed here, this narrowing is due to an increase in hopping time for polarons associated with V4+ ions. By similar analyses, the systems of RCaOV2O5, RBaOV2O5, and RLi2OV2O5 exhibit comparable polaron hopping frequency limits of 480 ± 20 MHz, 469 ± 20 MHz, and 468 ± 20 MHz, respectively, when R is near 1.0. Data taken at various temperatures ranging from room temperature to 4.2 K reveal that EPR spectra linewidths are not dependent upon temperature.

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