WILLIAM JEWELL COLLEGE

October 24, 2008

Professor Steven A. Feller
Department of Physics
Coe College
1220 First Ave NE
Cedar Rapids, Iowa 52402

Dear Steve:

On behalf of the Dr. Blane Baker and myself in the Physics Department at William Jewell College I write to express our enthusiastic interest in long-term collaboration with Coe College in glass research. We anticipate Jewell students traveling to Coe College for glass fabrication and differential calorimetry analysis. We further anticipate Coe College students working alongside our students here at Jewell in EPR experiments.

The Department of Physics at William Jewell College has a Bruker EMX EPR spectrometer operating in X-band with a 10" magnet. The system is also equipped with a Bruker liquid Helium cryostat which, in conjunction with an Oxford Instruments controller, is capable of sample temperature control from 4 K to room temperature. A nitrogen vapor temperature control system can be used for experiments above room temperature. A Kimmon Electric single-mode HeCd laser is available for excitation at 442nm and 325 nm. For single-crystal work angular dependences can be obtained and then modeled using the appropriate spin Hamiltonian in MATLAB. Glass spectra can be modeled using Bruker's Symphonia software.

Two faculty at Jewell work extensively with undergraduate students in research involving EPR. Generally two or more students are pursuing EPR research in any given semester. The college also funds the Pillsbury Summer Research Scholars Program which provides stipends and housing for three or more students each summer who may elect to do EPR. Students have also been sponsored by Research Corporation in EPR of glass and polymers. Coe College students have also visited William Jewell College and participated in temperature dependent EPR measurements on vanadium oxide glass.

Recent EPR glass work has focused on determining the variation in polaron hopping frequency for different alkali and alkaline earth vanadate glasses formed by roller quenching at Coe College. EPR spectra in several mixed vanadate systems reveal hyperfine structure (hfs) lines that vary with molar ratio R. In the $RNa_2OV_2O_5$ system, for example, hfs lines are not resolved at low R values (near 0.1); however, as R approaches 0.5, a dramatic narrowing of the lines occurs, revealing a hyperfine coupling parameter of order 17.7 mT. We find that the linewidth is roughly temperature independent down to 4.2K. Our tentative interpretation places an upper limit of 487 MHz for the polaron hopping frequency in the $RNa_2OV_2O_5$ system. From similar analyses, the systems of $RCaOV_2O_5$, $RBaOV_2O_5$, and $RLi_2OV_2O_5$ have upper-limit polaron hopping frequencies of 480 MHz, 469 MHz, and 468 MHz, respectively, for R = 1.0. We very much look forward to additional work on these interesting systems.

Sincerely,

Pat Bunton

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