Eu K-edge EXAFS of Eu-doped oxide glasses

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Lanthanide-doped glasses are crucial for fibre amplifiers and other optical applications. We are carrying out a theoretical study of the luminescence mechanism in Eu-doped glasses (see Figure 1) [1]. The Eu K-edge EXAFS data will give quantitative information on the local atomic environment of Eu ions, which is essential for validating our molecular dynamics (MD) models (see Figure 2) [2]. EXAFS measurements were carried out on approximately 20 samples of different Eu-doped oxide glasses (including sodium silicate, borate, borosilicate and germanate). As the Eu content is low (~1 mol% Eu2O3), and the local atomic environment is disordered (i.e. glass), approximately 3-4 hrs per sample was needed (see Figure 3). The measurements were done in transmission using pellets (sample mixed with polymer). The data is now being analysed to determine Eu-O bond length and coordation number. Interestingly a Eu-O bond length of 2.31A, and coordination number of approximately 5 is seen for all samples, indicating that the local atomic environment of Eu does change. Information about higher shells, e.g. Eu-Si, was absent due to the large static disorder.

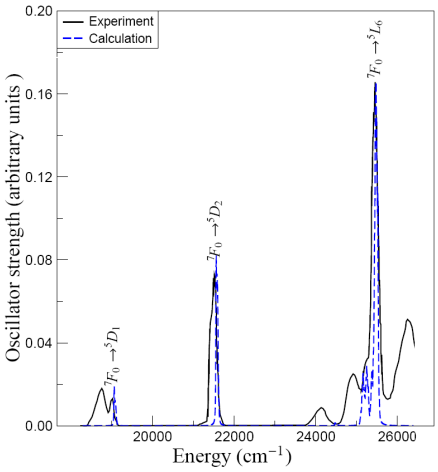

Figure 1: optical spectra of Eu-doped glass [1].

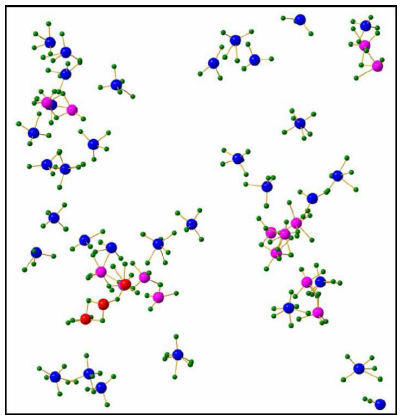

Figure 2: Eu ions in MD model of glass[2].

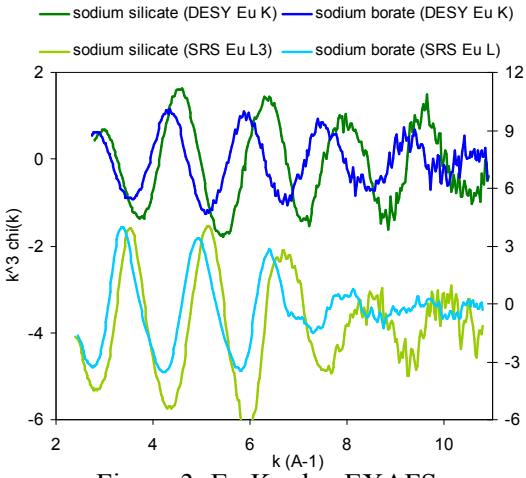

Figure 3: Eu K-edge EXAFS.

References

[1] T. Qin, M.F. Reid, Y-Y. Yeung, and G. Mountjoy, submitted to Comp. Phys. Comm. (2010).
[2] N. Afify, and G. Mountjoy, Phys. Rev. B **79** 024202 (2009).