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 coordination number. Interestingly a Eu-O bond length of 2.31 Å, 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].

References