Effect of Valence Change on Surface Stresses in EuPO3 Glasses

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Abstract

Effects of heat treatment in reducing and oxidizing atmospheres on the valence states and resulting stresses was examined in europium metaphosphate glasses. Glasses were prepared through a melt-quench method, cut and polished to an optical quality. Samples were heat treated above and below Tg. Surfaces stresses created by the valence changes were probed through the number of cracks generated around Vickers indents and birefringence measurements. Changes in structure and valence state were observed through Raman spectra. An increased number of cracks were observed with heat treating Eu3+ metaphosphate glasses in a reducing environment, corresponding to the generation of tensile stresses caused by a change from Eu3+ to Eu2+. A corresponding change in the area of the O-P-O bridging oxygen Raman peak was observed.

Keywords: Glass, Metaphosphate, Valence change, Surface Stresses, Raman Spectroscopy

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