# Local environment of iron ions in magnesium aluminosilicate glasses from liquid helium temperature to glass transition temperature

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**Abstract**

Iron is the key element to affect the coloration of glass in ultraviolet and near-infrared regions. From the energy point of view, the sheet glass, for example, has to be tailored to have optimized optical absorption to improve energy-saving of house and building. Glass coloration has been well known to strongly depend on oxidation and coordination states of iron, and precise understanding of the iron speciation and its correlation with glass structure promote to add new functionality to glass.

This study gives our focus on aluminosilicate glass system, especially magnesium aluminosilicate glass. Since Al3+ and Mg2+ have close ionic radius to those of Fe3+ and Fe2+, respectively, site distribution of Fe is of particular interest in this glass system. The purpose of this study is to understand the local environment of Fe ions in magnesium aluminosilicate glasses by measuring the optical absorption spectra as functions of glass composition and temperature.

UV-Visible-NIR absorption spectroscopy (UV-Vis) was applied to the glass samples at the temperature from _˜100K to around glass transition temperature. Electron paramagnetic resonance (EPR) spectroscopy was also used to evaluate local environment of Fe3+. By combining these approaches, the relations between local structure of Fe (e.g. redox state, site distribution, site distortion) and structural flame work of aluminosilicate glasses are discussed.

**Keywords:** Iron, aluminosilicate glass, structure, optical absorption spectroscopy, electron paramagnetic resonance

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