

The Structure around Iron Ions and their Optical Absorption in Soda Lime Glass

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Abstract

Iron oxide is the popular coloring component in the glass industry, but its importance is increasing in commercial flat glass because it is much more used than ever in the automotive application like ultraviolet ray and solar heat absorbing glass and low transmittance glass. But the structure around iron ions and their optical absorption are not fully understood yet and are still worth studying. The objective of this work is to examine the structure around iron ions in glass and to correlate it to their optical absorption. Iron exists in two states in glass, one is ferric ion and another is ferrous ion. Ferric ion is usually thought to be in tetrahedral coordination and has absorption mainly in ultraviolet region and shorter wavelength region in the visible light. However it is reasonable to suppose the existence of octahedrally coordinated ferric ion with stronger absorption in the same wavelength region, if glass contains larger amounts of iron oxide. Ferrous ion is in octahedral coordination and has absorption mainly in the infrared region and longer wavelength region in the visible light. The structure is very sensitive to the glass composition and to the thermal history after it is formed, and its optical absorption is relatively easily varied with them.