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Structural investigation of platinum solubility in silicate glasses

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ABSTRACT

The coordination environment of 20-200 ppm Pt in yellowish glasses from the $CaO-Al_2O_3-SiO_2$ (CAS) ternary was studied using X-ray absorption fine structure spectroscopy at the Pt-L_{III} edge. Analysis of the Pt-L_{III} edge region suggests that Pt in these glasses is mainly tetravalent and sixfold-coordinated by O (with a mean Pt-O distance of 2.08 ± 0.02 Å). No evidence for Pt^{2+} or Pt^{6+} was found in any of the glasses studied, suggesting that one can not derive valence information easily from solubility data. No second-neighbor contribution was observed around $Pt^{4+}O_6$ polyhedra. However, bond-valence modeling suggest that these polyhedra are likely to bond mostly to $^{[VI]}Ca^{2+}$, which should promote high positional disorder of second-neighbor cations around Pt. This particular bonding arrangement may explain the relatively high solubility of Pt in these relatively depolymerized melts, as $CaPtO_3$-type units.