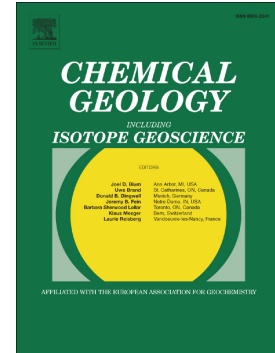


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## Structure and properties of lead silicate glasses and melts

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### **Abstract**

Viscosity, density and glass transition temperature measurements were performed on the simple PbO-SiO<sub>2</sub> system with increasing PbO content from 5 to 70 mol.%. The results of these analyses have been complemented by spectroscopic studies (Raman & X-Ray Absorption Spectroscopy) in order to link macroscopic properties to structural information at short- and middle-range order. A strong decrease of the viscosity is observed even with the incorporation of 5 mol.% PbO, and this decrease goes on with the increase of PbO content. This effect is confirmed by the continuous decrease of the glass transition temperature with increasing PbO content. Based on our interpretations of Raman spectra, which show similarities to alkali or earth-alkaline-silicate glasses, these effects appear to arise from depolymerization of the silica network. Consequently, lead acts as a network modifier even at low content. Although, it could form PbO<sub>4</sub> tetrahedra when it is present in large quantities, it cannot be asserted that lead acts as a network former at high lead content.

**Keywords:** lead silicate, Raman spectroscopy, Viscosity, glasses, structure of glasses and melts

### **Highlights**

- Lead silicate glasses were made from 95 to 30 mol.% SiO<sub>2</sub>.
- Pb cation acts as network modifier even above the orthosilicate composition (more than 65 mol.% PbO).
- Viscosity and deconvolution of all Raman spectra in the PbO-SiO<sub>2</sub> system are presented.

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