

Universality of ionic percolation channels in supercooled melts and glasses: With implications on melt viscosity

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Understanding the links between chemistry, nanostructure and properties of silicate glasses and melts remains a fundamental problem both for Earth and Materials Sciences. Central to this, is whether the distribution of mobile metallic ions, like alkalis, can be considered random or not. This drastically affects our understanding of their properties, and ways to model them. We report viscosity, Raman, Nuclear Magnetic Resonance measurements combined with molecular dynamics simulations on alumino-silicate glasses supporting the contention that the micro-segregation of metallic ions into percolation channels is a universal phenomenon, strongly influenced by their ionic field strength. Such nanostructure critically affects melt viscosity, and probably nucleation and crystallization phenomena as well as volatile degassing.