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LETTER

Structural investigation of Mg local environments in silicate glasses by ultra-high field ^{25}Mg 3QMAS NMR spectroscopy

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ABSTRACT

Structural information on divalent cations such as Mg^{2+} should have important implications for magmatic liquids because of their abundance in the Earth's interior; nevertheless, little is confirmed about their coordination environments. We here apply a ^{25}Mg triple-quantum magic-angle spinning (3QMAS) NMR technique at an ultra-high magnetic field (21.8 T) and successfully show the occurrence of multiple Mg sites in $MgSiO_3$ glass. We find that these sites are distinguished by the degree of polyhedral distortion, not by the coordination number. The present study concludes that the highly distorted MgO_6 species occur in $MgSiO_3$ glass, in strong contrast with a recent radial distribution study.

Keywords: Mg local environment, $MgSiO_3$ glass, ^{25}Mg 3QMAS NMR, ultra-high magnetic field