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HIGHLIGHTS AND BREAKTHROUGHS

Absence of pressure-induced electron spin-state transition of iron in silicate glasses upon compression

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Abstract. Upon compression, silicate melts in the Earth's interior are expected to be subject to successive structural transitions with multiple densification mechanisms that are distinct from those of their crystalline analogs. Experimental verification of this phenomenon remains a major target of glass-melt studies. Early studies of Fe spin-state transitions in silicate glasses under compression used synchrotron X-ray emission spectroscopy (XES) to develop seemingly irreconcilable interpretations that vary from complete transitions to low spin states at high pressure to a prevalence of high spin states. In an effort to reconcile the controversy, Mao et al. (February-March 2014 issue of *American Mineralogist*) showed that the XES data must be properly handled with a correct reference spectrum for each spin state and suggested that the subtle effect of pressure-induced broadening in the spectra be considered. Based on the new analyses, they concluded that no pressure-induced spin-state transitions exist in iron-bearing silicate glasses at high pressure, relevant to Earth's deep lower mantle. Thanks to several series of experimental studies, the elusive spin state in glasses under compression is being revealed, rendering the spin state of iron among the best understood for glasses at high pressure. **Keywords:** X-ray emission spectroscopy, electron spin-states, pressure, silicate glasses

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