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Dissolved Cl, oxygen fugacity, and their effects on Fe behavior in a hydrous rhyodacitic melt

Aaron S. Bell[1,*] and James D. Webster[2]

[1]Institute of Meteoritics, University of New Mexico, Albuquerque, New Mexico 87109, U.S.A.
[2]Department of Earth and Planetary Science, American Museum of Natural History, New York, New York 10024, U.S.A.

Abstract

We have conducted a series of experiments to evaluate the intrinsic effects of dissolved chlorine on $Fe^{3+}/\Sigma Fe$ and magnetite solubility in hydrous chloride-rich rhyodaciticliquids. The addition of Cl to the melt appears to have two prominent effects on iron in the melt: (1) dissolved Cl appears to perturb the magnetite-melt equilibrium, such that greater FeO^{total} contents are required to support magnetite saturation in Cl-bearing melts than in Cl-free melts of equivalent bulk compositions; and (2) a systematic and progressive decrease of the measured $Fe^{3+}/\Sigma Fe$ as f_{O_2} is increased. These two intimately related effects each have important implications for redox processes occurring in Cl-enriched arc magmas.

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