

LETTER

Accurate determination of ferric iron in garnets

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ABSTRACT

Numerous techniques are available to determine the amount of Fe²⁺ and Fe³⁺ in minerals. Calculating Fe²⁺ and Fe³⁺ by charge-balance using electron probe microanalysis (EPMA) data is the most common method, but several studies question the usefulness and accuracy of this approach (Canil and O'Neill 1996; Dyar et al. 1993, 2012; Lalonde et al. 1998; Li et al. 2005; McGuire et al. 1989; Schingaro et al. 2016; Schmid et al. 2003; Sobolev et al. 2011). We compile and compare data for natural garnets that have been analyzed by both EPMA and Mössbauer spectroscopy. Comparison of Fe³⁺/ΣFe determined by charge-balance vs. Mössbauer spectroscopy shows an approximate 1:1 correlation. The EPMA data set of Dyar et al. (2012) is reexamined and it is shown that disagreement between EPMA and Mössbauer for their data is not nearly as bad as reported. Data for charge-balance vs. Mössbauer spectroscopy are compared and show that the EPMA/charge-balance approach provides a suitable alternative when other methods are not practical.

Keywords: Ferric iron, EPMA, charge-balance, Mössbauer spectroscopy