

FERROUS IRON IN CORDIERITE: A NON-STRUCTURAL COMPONENT IN THE CHANNEL CAVITIES

Rossmann, George R., Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena, California 91125;
Goldman, Don S., Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena, California 91125

When a series of minerals of various iron contents in the cordierite-sekaninaite series were studied by optical absorption spectroscopy to determine the intensity of near-infrared absorption bands of iron in the geometrically distorted (Mg,Fe) site, two spectroscopically distinct types of ferrous iron were observed. One, with intensity comparable to that found for ferrous iron in six-coordinate sites of typical 2.1 Å Fe-O bond lengths which produced bands at 980 and 1150 nm and correlated with total iron content, was assigned to structural iron. Another which had its most prominent component at 950 nm in the γ -polarization did not correlate with total ferrous iron and was assigned to ferrous iron in a large, distorted coordination site in the channel cavities. Both the optical and powder Mossbauer spectra indicate that only a small fraction of the iron occurs in the channels in disagreement with earlier single-crystal Mossbauer interpretations. The possibility that non-structural ferrous iron occurs in other minerals with structural features similar to the channels of cordierite was also examined. Spectra of beryl indicate that two types of iron occur in this mineral, although interference from carbon dioxide and water make it difficult to analyze the data. Optical spectra present strong evidence for two types of iron in osunilite, one structural and one in the closed cavities.