

Calorimetric data for naturally occurring magnesiocarpholite and ferrocapholite

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ABSTRACT

Low- and high-temperature heat capacities of natural ferrocapholite and magnesiocarpholite samples from the island of Crete (Greece) were measured using the heat-capacity option of the Physical Properties Measurement System (PPMS, Quantum Design), which is based on the principles of heat-pulse calorimetry (HPC), and by differential scanning calorimetry (DSC). Comprehensive chemical analyses also have been performed on these samples by electron-microprobe analysis (EMPA), inductively coupled plasma mass spectrometry (ICP-MS), and Karl-Fischer titration (KFT) for H₂O. In addition, the ferrocapholite sample has been investigated by Mössbauer spectroscopy (MS). The measured heat capacities were corrected to end-member compositions of ferrocapholite and magnesiocarpholite. The standard entropy of end-member ferrocapholite Fe²⁺Al₂[Si₂O₆](OH)₄ and end-member magnesiocarpholite MgAl₂[Si₂O₆](OH)₄ were determined as 248.1 ± 0.3 J/(mol·K) and 221.5 ± 0.2 J/(mol·K), respectively. The C_p-polynomial for end-member ferrocapholite is C_p = 652.05 – 6.0995 × 10³ T^{-0.5} – 2.0980 × 10⁶ T⁻² + 2.9396 × 10⁸ T⁻³ [J/(mol·K)], valid in the temperature range of 298.15–625 K, and that for end-member magnesiocarpholite is C_p = 644.08 – 6.0921 × 10³ T^{-0.5} – 2.2825 × 10⁶ T⁻² + 3.3182 × 10⁸ T⁻³ [J/(mol·K)], valid in the temperature range of 298.15–725 K.

Keywords: Heat pulse calorimetry, differential scanning calorimetry, heat capacity, ferrocapholite, magnesiocarpholite