



Thermodynamic properties of lizardite, determined by calorimetry.

Hélène Gailhanou, Philippe Blanc, Georges Mikaelian, J. Rogez, H. Kawaji,
Philippe Vieillard, Benoit Madé, Jean-Marc Greneche

► To cite this version:

Hélène Gailhanou, Philippe Blanc, Georges Mikaelian, J. Rogez, H. Kawaji, et al.. Thermodynamic properties of lizardite, determined by calorimetry.. International Symposium on Solubility Phenomena and Related Equilibrium Processes (ISSP) - 2018, Jul 2018, Tours, France. . hal-01720566

HAL Id: hal-01720566

<https://brgm.hal.science/hal-01720566>

Submitted on 1 Mar 2018

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Abstract submitted for: ☐ Oral and Paper ; ☐ Oral ; ☐ Flash Oral; ☒ Poster

THERMODYNAMIC PROPERTIES OF LIZARDITE, DETERMINED BY CALORIMETRY

H. Gailhanou¹, P. Blanc¹, G. Mikaelian², J. Rogez², H. Kawaji³, J-M. Grenèche⁴, P. Vieillard⁵ and B. Madé⁶

¹BRGM, Orléans, France

²IM2NP-UMR-CNRS, Marseille, France

³Tokyo Institute of Technology, Yokohama, Japan

⁴IMMM-UMR-CNRS, Le Mans, France

⁴IC2MP-HYDRASA, Poitiers, France

⁵Andra, Châtenay-Malabry, France

e-mail (corresponding author): h.gailhanou@brgm.fr

In the context of radioactive waste disposal, the long term stability of the natural and engineered clay barriers must be assessed over hundreds of thousands of years. In particular, in the framework of glass/iron/clay interactions, recent experimental works have brought evidences of the precipitation of serpentine-like mineral. Until now, very few thermodynamic data are available for the serpentine minerals. The most common polymorphs are lizardite, chrysotile and antigorite. This study aims to determine a consistent thermodynamic dataset for a natural lizardite, in order to be integrated in thermodynamic databases (e.g., THERMODDEM (Blanc et al., 2012), ThermoChimie (Giffaut et al., 2014)) for geochemical modelling.

The lizardite sample, highly crystallized, was coming from Monte-Fico (Elba, Italy). The mean structural formula of the lizardite mineral was determined from microprobe analyses and ⁷⁷Fe Mössbauer spectrometry: (Si_{1.908}Al_{0.074}Fe³⁺_{0.017})(Mg_{2.722}Fe²⁺_{0.094}Fe³⁺_{0.048}Al_{0.105}Mn_{0.002})O₅(OH)₄. The sample contains 25 wt.% of chrysotile according to Viti et al. (2011). The methodology used to determine the thermodynamic properties of the lizardite was described in Gailhanou et al. (2013). The standard enthalpy of formation at 298.15 K was obtained by acid solution calorimetry in HF-HNO₃ solution. The heat capacity were measured from 2 K to 300 K by PPMS and between 298 K and 520 K by DSC. The third-law entropy was determined by adding the measured calorimetric entropy and estimated residual entropy terms (configurational and magnetic). The Gibbs free energy of formation was then calculated from the standard enthalpy and entropy of formation.

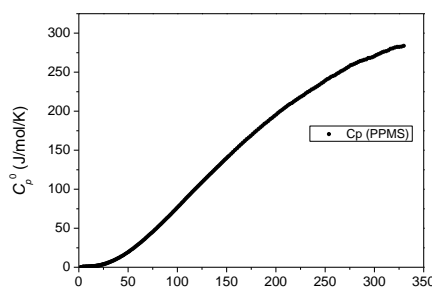


Figure 1. Heat capacity measurements for lizardite.

References:

- Blanc, P. *et al.* (2012) *Applied Geochem.* **27**, 2107-2116.
 Gailhanou, H. *et al.* (2013) *Amer. Miner.* **98**, 1834-1847.
 Giffaut, E. *et al.* (2014) *Applied Geochem.* **49**, 225-236.
 Viti, C. *et al.* (2011) *Amer. Miner.* **96**, 1003-1011.

