

## **The CaO-MgO-CO<sub>2</sub>-H<sub>2</sub>O-organo system revisited: New insights from thermodynamic modelling of mineral phase transformations**

Wedenig, Michael<sup>1</sup>; Baldermann, Andre<sup>1</sup>; Eder, Stefan<sup>2</sup>; Dietzel, Martin<sup>1</sup>

1 Institute of Applied Geosciences, Graz University of Technology, Rechbauerstraße 12, A-8010 Graz, Austria; 2 RHI Magnesita, Magnesitstraße 2, A-8700 Leoben, Austria.

The refractory industry is increasingly using carboxylic acids, such as acetic and citric acid, to control the hydration behaviour of cast products containing periclase [MgO]. The reaction pathways of MgO dissolution and subsequent Mg-aquo/organo complexation, as well as the precipitation/re-dissolution of Mg-organo salts versus the hydration of MgO to form brucite [Mg(OH)<sub>2</sub>] are still poorly constrained. The common mineral impurities in the active or dead-burnt MgO products, such as lime [CaO], calcite [CaCO<sub>3</sub>] or dolomite [CaMg(CO<sub>3</sub>)<sub>2</sub>] complicate the process understanding. Using the computer code PHREEQ-C and the carbfix.dat database, which was adapted by reported and experimentally obtained solubility data of various Mg/Ca-organo salts, we have modelled a series of reaction pathways in the CaO-MgO-CO<sub>2</sub>-H<sub>2</sub>O-organo system. The developed thermodynamic models allow an enhanced understanding of i) the respective stabilities of the relevant binder phases and ii) the organo-complexation behaviour of Mg and Ca as a function of the prevailing pH, acid concentration and Mg/Ca ratio.