

## Gypsum Crystal Growth Kinetics at Elevated Pressures

P.M. RENDEL<sup>1,2\*</sup>, I. GAVRIELI<sup>2</sup>, D. WOLFF-BOENISCH<sup>3</sup>  
AND J. GANOR<sup>1</sup>

<sup>1</sup>Department of Geological and Environmental Science,  
Ben-Gurion University of the Negev, Beer Sheva 84105,  
Israel (correspondence: rendel@post.bgu.ac.il)

<sup>2</sup>Geological Survey of Israel, 30 Malkhe Israel, Jerusalem,  
95501, Israel (ittai.gavrieli@gsi.gov.il)

<sup>3</sup>Department of Applied Geology, Curtin University, GPO Box  
U1987, Perth, 6845 WA, Australia  
(domenik.wolff-boenisch@curtin.edu.au)

The growth of gypsum seed crystals from supersaturated solutions has been widely studied under various experimental conditions (e.g. temperature, ionic strength and degrees of saturations), but only few studies considered the impact of pressure. In the present study, the investigation of gypsum growth has been extended from atmospheric pressure to pressures of up to 100bar.

A series of pressurized batch and flow-through experiments were conducted in order to establish the solubility and crystal growth rates of gypsum at high pressures (25, 35, 50, 70, 100bar). Experiments were performed at 25°C in a high pressure titanium reactor by mixing CaCl<sub>2</sub> and NaSO<sub>4</sub> solutions, reaching an initial degree of saturation in respect to gypsum of  $\Omega=1.81$ .

Solubilities attained in the batch experiments accurately match the new PHREEQC ver.3 predictions, in which pressure is one of the new variables. Preliminary flow through experiments, show that crystal growth rates slightly change as a function of pressures. The observed changes in the crystal growth rates occur due to the effect of pressure on the apparent molar volumes of species in the solution, the latter changes the mineral solubility, as has been recently suggested by Appelo et al. [1], based on thermodynamic considerations.

[1] Appelo, Parkhurst & Post (2014), *Geochim. Cosmochim. Acta* **125**, 49-67.