

## Interaction of dissolved lead with calcite and gypsum at acidic conditions

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Clean water reservoirs have been continuously decreasing in the Earth due to anthropogenic effects. Contamination by  $\text{Pb}^{2+}$  is a real threat for the quality of drinking water not only in developing countries but also in specific settings in developed economies. Water lead pollution has an especially negative impact on the health of children, affecting their neurological development with long-lasting effects. Different researches have highlighted the remarkable ability of the surfaces of sedimentary rock-forming minerals like gypsum ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ) [1] and calcite ( $\text{CaCO}_3$ ) [2] to uptake  $\text{Pb}^{2+}$  and reduce its concentration in natural waters to values close to the maximum admissible. In previous studies the  $\text{Pb}^{2+}$  uptake behavior of gypsum and calcite surfaces has been investigated independently. Here we study the removal of dissolved  $\text{Pb}^{2+}$  as a result of the interaction of the lead-bearing solution (2072 ppm) with mixtures of gypsum and calcite (1:1). Lead uptake has been explored for two initial pHs (2.5 and 5.5) of the aqueous solution during increasing reaction times (from 5 minutes to 24 hours) at atmospheric conditions.

Our results show a rapid decrease of  $\text{Pb}^{2+}$  concentration in the aqueous solution, which is accompanied by a concomitant increase of both,  $\text{Ca}^{2+}$  concentration and pH. This evolution of the aqueous solution chemistry is consistent with  $\text{Pb}^{2+}$  removal taking place through the coupling of gypsum and calcite dissolution and the precipitation of Pb-bearing solid phases. Regardless the initial pH the formation of secondary anglesite ( $\text{PbSO}_4$ ) and cerussite ( $\text{PbCO}_3$ ) is confirmed by SEM and XRD analyses. The formation of hydrocerussite ( $\text{Pb}_3(\text{CO}_3)_2(\text{OH})_2$ ) crystals is also observed when the solution initial pH is 5. In all the cases anglesite is the first phase to precipitate, forming on the surfaces of both, gypsum and calcite as well as in the bulk solution. Cerussite and hydrocerussite are only observed to form on the surface of calcite crystals. We interpret the precipitation sequence taking into consideration the dissolution kinetics of gypsum and calcite and the solubilities of the primary and secondary mineral phases.

[1] Godelitsas et al. (2003). *Environ. Sci. Technol.*, **37**, 3351.

[2] Astilleros et al. *Appl. Geochem.*, **25**, 1008.