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Article

Recovery of Lead and Zinc from Zinc Plant Leach Residues by Concurrent Dissolution-Cementation Using Zero-Valent Aluminum in Chloride Medium

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Supplementary information

1. Thermodynamics Calculation of Dissolution PbCO₃ at Different Chloride (Cl⁻) Concentration and pH

To check the effects of Cl^- concentration and pH on the dissolution of $PbCO_3$, thermodynamics calculations were carried at experimental final pH values using the Geochemist's Workbench® with the MINTEQ database as shown in Figure S2. As can be seen from Figure S2, pH has no effects on the dissolution of $PbSO_4$ but Cl^- concentration. The corroborate with the chemical reaction (Equation S2)
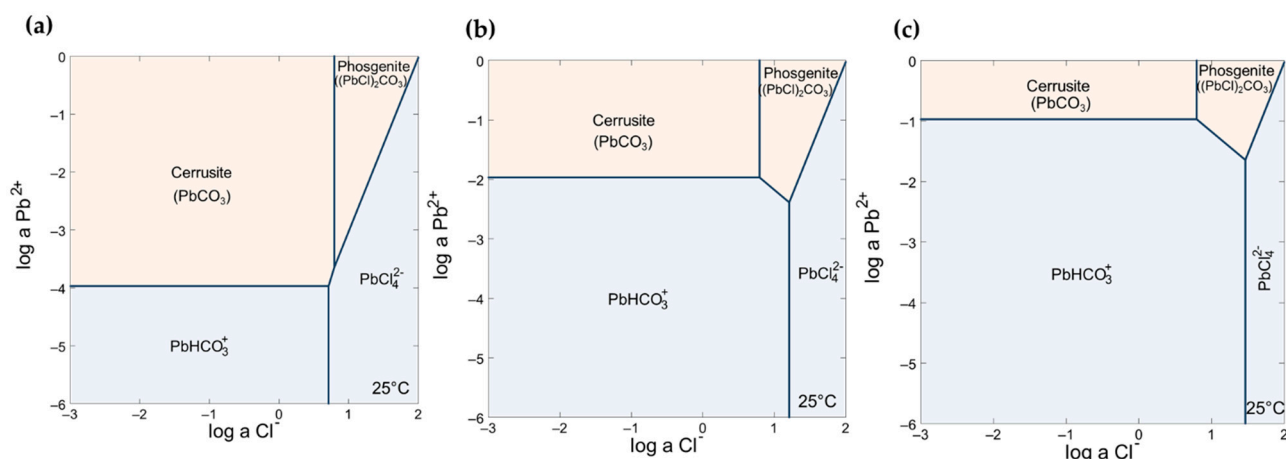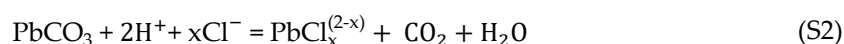
$$PbCO_3 + 2H^+ + xCl^- = PbCl_x^{(2-x)} + CO_2 + H_2O \qquad (S2)$$

Figure S1. log-log activity of Pb^{2+} and Cl^- at 25 °C, 1.013 bars, and $CO_3^{2-} = 10^{-5}$ M for (**a**) pH 4, (**b**) pH 2, and (**c**) pH 1 for 0.01, 0.05, and 0.1 M HCl (created using the Geochemist's Workbench® [1] with the MINTEQ database [2]).

2. XRD Analysis of the ZPLRs before and after the Treatment of ZPLRs by Concurrent Dissolution-Cementation Technique

Semi-quantitative analysis of ZPLRs before and after treatment by concurrent dissolution-cementation technique was carried out using XRD. Figure S3 shows the comparison of the XRD of the two said residues. Disappearance and reduction of the intensity of minerals such as anglesite, gypsum dihydrate, and cerussite, zinkosite were not after treating ZPLRs in the solution composed of 3 M NaCl and 0.05 M HCl.
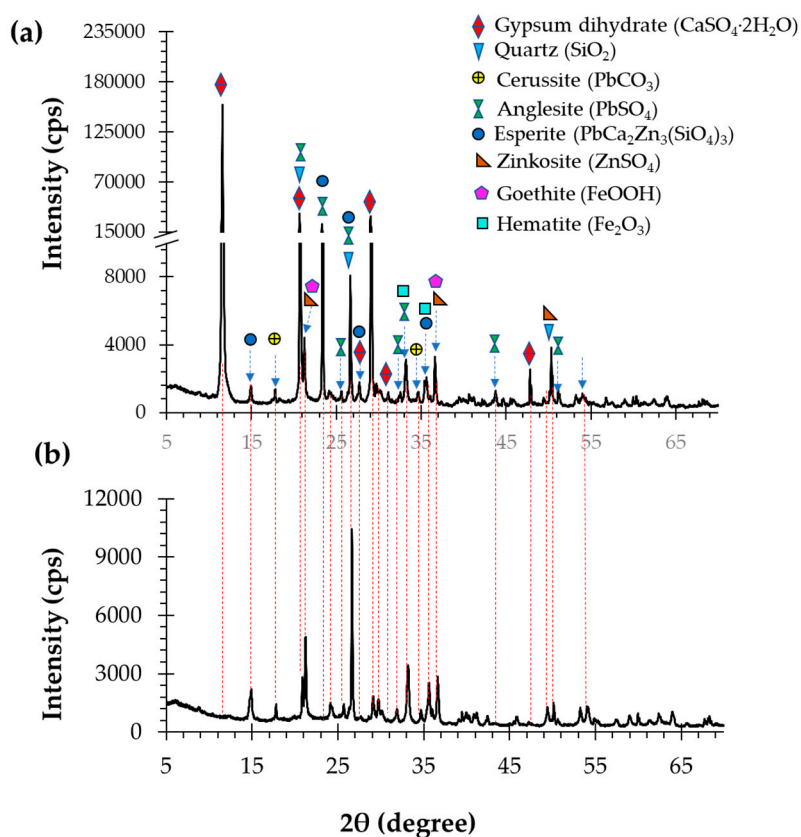

Figure S2. XRD pattern of (**a**) ZPLRs before treatment and (**b**) the residues obtained after treating ZPLRs by the concurrent dissolution-cementation technique in the solution composed 3 M NaCl and 0.05 M HCl.

References

1. Bethke, C.M. *The Geochemist's Workbench—A User's Guide to Rxn, Act2, Tact, React, and Gtplot*. University of Illinois, Urbana, IL, USA, 2002.
2. Gustafsson, J.P. Visual MINTEQ Thermodynamic Databases in GWB Format. Available online: https://vminteq.lwr.kth.se/(accessed 23 March 2020).