A thermodynamic model for \( \{\text{Pb}^{2+} - \text{H}^+ - \text{Na}^+ - \text{K}^+ - \text{Mg}^{2+} - \text{Cl}^- - \text{OH}^-\} \text{aq} \) at 298 K, 0.1 MPa, and 0 ≤ ionic strength ≤ solid saturation

DR. CHARLES S OAKES

unaffiliated

Presenting Author: oakescs@netscape.net

A Pitzer ion-interaction model is presented for the \( \text{Pb}^{2+} - \text{H}^+ - \text{Na}^+ - \text{K}^+ - \text{Mg}^{2+} - \text{Cl}^- - \text{OH}^- \) system at 298 K and 0.1 MPa. Model parameters for interactions not involving Pb species were taken from Harvie et al. [1]. Dimensionless standard state chemical potentials for all Pb species, including solids and excepting \( \text{Pb}^{2+} \), were fitted; the NEA value was used for \( \text{Pb}^{2+} \). Our model reproduces the most accurate emf and solubility data from infinite dilution to solid saturation for all Pb-chloride salts. The model also reproduces \( \text{PbCl}_2\text{(cr)} \) solubility in \( \text{HCl(aq)} \leq 9 \) molal.

In contrast to the 21 interaction parameters involving Pb-solute species in Felmy et al. [2], our model uses only 8 – none of which are “ternary” or neutral species terms. The Felmy model is based upon faulty data and uses the Millero & Byrne [3] model parameters for \( \text{PbCl}_2 + \text{H}_2\text{O} \). The latter model is valid to \( I \leq 1 \) molal, however, it uses a \( C_{Zn,Cl} \) parameter as an analog for \( C_{\text{Pb},Cl} \). Adoption of this term, with a sign error, undoubtedly contributed to the peculiar and excessive parameterization in the Felmy model.