Solubility Correlation of H_2S in H_2O and NaCl(aq) up to 573 K and 40 MPa

Nikolay Akinfiev
Institute of Geology of Ore Deposits, Petrography, Mineralogy and Geochemistry, Russian Academy of Sciences, Moscow, Russia

Vladimir Majer [C, S]
Institute of Nanomaterials, Advanced Technologies and Innovation, and Department of Chemistry, Technical University of Liberec, Liberec, Czech Republic
vladimir.majer@tul.cz

Youri Shvarov
Department of Geology, Moscow State University, Moscow, Russia

While the data characterizing dissolution of carbon dioxide in aqueous solutions at geological conditions are numerous much less information is available on solubilitiy of hydrogen sulfide. Yet these data are of high practical interest in connection with removal of H_2S from the streams of raw natural gas and its subsequent storage in underground aquifers. In this contribution the selected reliable literature data on solubility of H_2S in H_2O and NaCl(aq) are used to establish a representative correlation as a function of temperature, pressure and NaCl concentration. The state behaviour of H_2S in the vapour phase is calculated from the equation of state by Lemmon and Span (J.Chem.Eng.Data 2006, 51,785) and the Henry's law constants generated from the SOCW model for hydration properties of H_2S(aq) (Majer et al. Fluid Phase Equilib. 2008, 272, 65). The activity coefficients of hydrogen sulfide in pure water and salt solution are expressed by the Pitzer interaction model. The parameters for NaCl(aq) were taken from the review of Archer (J.Phys.Chem.Ref.Data 21, 1992, 793) while those for H_2S in binary and ternary solution are newly determined. Since the numeric calculation is rather complex an interactive software is available on internet allowing generation of solubilities and activity coefficients of hydrogen sulfide at a given temperature, pressure and concentration of NaCl.