Multiphase simulation of mine waters and aqueous leaching processes

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Abstract. Managing of large amounts of water in mining and mineral processing sites remains a concern in both actively operated and closed mining areas. When the mining site with its metal or concentrate producing units is operational, the challenge is to find either ways for economical processing with maximum yields, while minimizing the environmental impact of the water usage and waste salt treatments. For safe closure of the site, the environmental control of possible drainage will be needed. For both challenges, the present-day multiphase process simulations tools can be used to provide improved accuracy and better economy in controlling the smooth and environmentally sound operation of the plant. One of the pioneering studies in using the multiphase thermodynamic software in simulation of hydrometallurgical processes was that of Koukkari et al. [1]. The study covered the use of Solgasmix equilibrium software for a number of practical acid digesters. The models were made for sulfuric acid treatments in titania pigment production and in NPK fertilizer manufacturing. During the past two decades the extensive data assessment has taken place particularly in geochemistry and a new versions of geochemical multiphase equilibrium software has been developed. On the other hand, there has been some progress in development of the process simulation software in all the aforementioned fields. Thus, the thermodynamic simulation has become a tool of great importance in development of hydrometallurgical processes. The presentation will cover three example cases of either true pilot or industrial systems including a South African acid mine water drainage treatment, hydrometallurgical extraction of rare earths from uranium leachate in Russia and a multistage process simulation of a Finnish heap leaching mine with its subsequent water treatment system.

References

1. P. Koukkari, H. Sippola, A, Sundquist, *Hydrometallurgy*, **94**, 139 (1994)

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