Ni availability/Ni solid phases in soils and waters from ultramafic complexes in Brazil: A narrow relationship

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The modification of Ni availability and lability consequently to mining and metallurgical activity was studied in the two ultramafic complexes of Barro Alto and Niquelândia (BA and NIQ, resp., Goías State, Brazil). Soils, ores, metallurgical wastes as well as surface waters samples were collected.

Stable Isotopic Exchange Kinetic technique (SIEK, [1]) was applied to solid samples to assess both the kinetic of solid-solution transfers and total exchangeable pool of Ni (E_{Ni}). Moreover, for the nearly first time, this technique was performed on natural water samples to quantify the pool of isotopically exchangeable Ni from the suspended particulate matter (SPM) in water, defined here as E^W_{Ni}. Goethite, chlorite, talc and serpentine were identified by XRD, SEM-EDS and TEM as the main Ni bearing phases in SPM located far from metallurgical activity (BA site), while in samples located in the area influenced by metallurgy (NIQ site) Ni was mainly associated to spherical micrometric particles related to fly ash produced by the ore combustion.

This difference in Ni bearing phases between BA and NIQ sites induces a difference of Ni exchangeable pool: up to 565 mg L^{-1} in NIQ samples (E^W_{Ni} value) while in BA it only reached 62 mg L^{-1}. These E^W_{Ni} values correspond to total exchangeable Ni in SPM (E_{Ni} values) of 49,000 and 2350 mg kg^{-1} for BA and NIQ sites, resp.

Consequently, sites located in the metallurgy influence area display higher E_{Ni} amount and slower exchanges kinetics, revealing that anthropic activity significantly enhances Ni (bio)availability through the modification of its bearing phases [2].

[1] Sivry *Environ. Sci. Technol* **45** (2011) 6247-6253.[2] Zelano Coll. Surf. (2013)

The Isothermal Evaporation Phase Equilibria for Salt – Water System Focused on Zabuye Salt Lake

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There are a larger number of salt lakes in the Qinghai – Xizang Plateau, more than 200 salt lakes that spread out over 1 km^2. Of all salt lakes in Tibet, Zabuye salt lake has distinct characteristics from others, with an area of 247 km^2, and is famous for its high concentration of potassium, lithium and borate resources. Low concentrations of calcium and magnesium are advantageous for recovering lithium from brine. The potassium reserves of Zabuye Salt Lake is 7.43 million ton, Li_2CO_3 reserves is 1.74 million ton, B_2O_3 reserves is 0.71 million ton.[1] The composition of Zabuye salt lake falls under the complex system which includes lithium, sodium, potassium, carbonate, sulfate, chloride, and borate.

To exploit brine resources, it is essential to make use of local climatic resources such as wind and solar energy for solar pond techniques. The climate in the region of the Zabuye salt lake is windy, aried and the average temperature is about 273 K. Therefore, the isothermal evaporation phase equilibria, which was determined in the laboratory under the similar conditions, can objectively describe the interactions among the brine minerals and reveal the crystallization path of various salts.

By now, a series of researches about the stable and metastable phase equilibria of the salt – water system focused on Zabuye salt lake have been down at 273 K, 288 K, and 298 K.[2-6] Comparisons between the stable and metastable phase diagrams at different temperatures can obtain the information about the crystalloid forms and crystallization zones of salts at multi-temperature. These information, especially the solubilities of salts change with the temperature, co-existing ions, and the total concentration of salts in solution, are useful for the exploiting of brine. However, most of the previous researches focused on temperature above 288 K, and the isothermal evaporation phase equilibria at 273 K are only some subsystems of the complex system, the results are not enough for the comprehensive utilization of the brine, thus, the investigation about the more complex system are necessary.

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[1] Zheng (2010) *Acta Geologica Sinica*. **84**, 1523. [2] Zeng (2004) *J.Chem. Eng. Data*. **49**, 1648. [3] Zeng (2006) *J.Chem. Eng. Data*. **51**, 219. [4] Sang (2006) *J.Chem. Thermodynamics*. **38**, 173. [5] Sang (2010) *CALPHAD*. **34**, 64. [6] Zeng (2010) *J.Chem. Eng. Data*. **55**, 5834.

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