Geochemistry Modeling of Waste Water and tailing Interaction In ThomPson Nickel Mining Area

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Canada Thompson nickel mineral deposit has produced a large amount of waste water during mining and smelting. The waste water were mainly composed of electrolyte wastewater (EW), mine drainage (MW) and flushing water (FW); The concentration of dissolved nickel in the electrolytic wastewater was up to 50.3ppm.

The procedure of mine wastewater treatment is as follows: Firstly, mine drainage and flushing water were used to dilute electrolyte wastewater to reduce the total nickel content in the wastewater. Then lime was added to further reduce nickel content in the wastewater. After the second phase reaction, lime was added to the waste water hoarding in the pond, to fit the total nickel content of wastewater discharge standards.

Based on the software PHREEQC, this paper simulated the acidic wastewater treatment in this process. The results of the simulation showed that the mixing ratio is EW:MW:FW ＝16%:10%:74%, and the quantiy of Ni in mixing solution is 14.2 ppm. The quantity of lime and the precipitations for the first stage are 0.40 g/L and 1056 mg/L, respectively, and the water included nine precipitations of calcite, dolomite, apatite, hematite, strontianite, $Ba_3(AsO_4)_2$, diaspore, and two kind of nikel minerals of $Ni(OH)_2$ and Ni_2SiO_4. The concentration of Ni in the post-reaction water was 3.7 mg/L. For the second step, the content of lime and the precipitations of the second step are 1.80g/L and 16.2g/L, respectively. The water included sixteen precipitations of calcite, chalcocite, diopside, galenite, hematite, apatite, mica, metalaumontite, Ni_2SiO_4, chrysolite, selenium(Se), grammatite and uraninite. The quantiy of Ni in this post-reaction water is 0.5 ppm.