SESSION 5

Modeling and chemometric evaluation of acid mine drainage from gold mining in Johannesburg, South Africa

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ABSTRACT
The Witwatersrand region of South Africa is famous for its gold production and a major conurbation, centred on Johannesburg, has developed as a result of mining activity. A study was undertaken of surface and ground water in a drainage system in this area. Soils were also analysed from a site within the mining district. This study revealed that the ground water within the mining district is heavily contaminated and acidified as a result of oxidation of pyrite (FeS_2) contained within mine tailings dumps, and has elevated concentrations of heavy metals. Where the water table is close to surface, the upper 20 cm of soil profiles are severely contaminated by heavy metals due to capillary rise and evaporation of the ground water. The polluted ground water is discharging into streams in the area and contributes up to 20% of stream discharge, causing a lowering of pH of the stream water. Much of the metal load is precipitated in the stream: Fe and Mn precipitate as a consequence of oxidation, while other heavy metals are being removed by co-precipitation. The oxidation of iron has created a redox buffer which controls the pH of the stream water. The rate of oxidation and of dilution is slow and the deleterious effect of the addition of contaminated water persists for more than 10 km beyond the source.

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