Geochemistry of Mine Discharges at Makum Coalfield, Assam

Sk. Md. Equeenuddin[1*], S. Tripathy[2], P. K. Sahoo[2] and M. K. Panigrahi[2]
[1]Dept. of Mining Engineering, National Institute of Technology, Rourkela, India
[2]Dept. of Geology & Geophysics, Indian Institute of Technology, Kharagpur, India
*Email: equeen@nitrkl.ac.in

Acid mine drainage (AMD) is one of the most persistence environmental problems that coal mines are facing and is regarded as a worldwide problem (Younger, 1995). Generation of AMD at the Makum coalfield in the northeastern part of India is caused due to the presence of finely disseminated pyritohedron, framboidal and euhedral pyrite crystals both in coal and overburden. Secondary solid phases form due to oxidation of pyrite, mainly consist of hydrated sulphate complexes of Fe and Mg (copiapite group of minerals). These secondary sulphates also store the acidity as they are highly soluble (Wiese et al., 1987). The pH of direct mine discharges varies from 2.3 to 7.6 with very high concentration of SO_4^{2-} (176–3615 mg/L). The variation of pH in the study area is possibly controlled by the interaction of mine discharges with carbonate minerals present in the overburden. Acidic discharges are highly enriched with Fe, Al, Mn, Ni, Pb and Cd, while Cr, Cu and Zn are below their maximum permissible limit in most mine discharges. Creeks carrying the direct mine discharges are highly contaminated; whereas major rivers are not much impacted by AMD. Ground water close to the collieries and AMD affected creeks are highly contaminated. Geochemical modeling indicates that Fe-oxyhydroxysulphates and Al-hydroxides are the dominant mineral phases likely to precipitate from the highly saturated AMD.

Keywords: Hydrogeochemistry; Acid Mine Drainage; Makum coalfield.

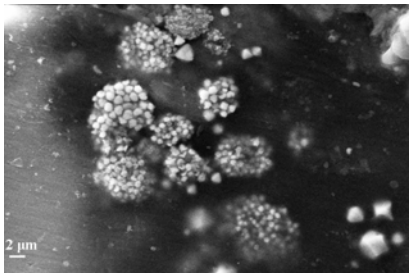

Figure 1. Scanning electron photomicrograph of framboidal pyrite in coal

References

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