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Inhibition of pyrite oxidation by surface coating agents: Batch and field studies

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The potential of several surface coating agents to inhibit the oxidation of metal sulfide minerals from Young-Dong coal mine and the Il-Gwang gold mine was examined by conducting laboratory scale batch experiments and field tests. Powdered pyrite as a standard sulfide mineral and rock samples from two mine outcrops were mixed with six coating agents (KH2PO4, MgO and KMnO4 as chemical agents, and apatite, cement and manganite as mineral agents) and incubated with oxidizing agents (H_2O_2 or NaClO). For the observed time period (8 days), Young-Dong coal mine samples exhibited the least sulfate (SO42−) production in the presence of KMnO4 (16%) or cement (4%) while, for Il-Gwang mine samples, the least SO42− production was observed in presence of KH2PO4 (8%) or cement (2%) compared to control. Field-scale pilot tests at the Il-Gwang site also showed that addition of KH2PO4 decreased SO42− production from 200 to 13 mg L^{-1} and it also reduced Cu and Mn from 8 and 3 mg L^{-1}, respectively to <0.05 mg L^{-1} (below ICP-OES detection limits). The experimental results suggested that the use of surface coating agents is a promising alternative for sulfide oxidation inhibition at acid mine drainage sites.