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Evaluation of feasibility of static tests applied to Küre VMS ore deposits

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Küre volcanogenic massive sulfide (VMS) ore deposits have been mined for its copper content for over centuries. However, there is no published data on AMD around Küre VMS ore deposits. This study investigates the sources of acid producing mechanisms in Küre, using field and laboratorial approaches. Geochemical static tests to predict AMD generation are widely applied to mining sites for assessing potential environmental consequences. However, there are well known limitations of these methods particularly resulting from assumptions used for calculations. To test the feasibility of the methods to predict potential of AMD generation of Küre (VMS) copper deposits, for the first time, acid production and neutralization potential of various mine wastes of Küre (VMS) copper deposits were determined. To test our static test results, in situ and laboratory geochemical data were also obtained from the groundwater discharges from Bakibaba underground mining tunnels.

Feasibility study showed that, despite a few inconsistencies, static tests were suitable for predicting generation of AMD around Küre copper mining site and reflected well the site conditions. The current study revealed that pulp density, defined as solid/liquid ratio and used for static tests, is an important limiting factor to predict reliable data for AMD generation. In this study, we also determined surface waters affected by AMD are predicted to have a pH value between 3 and 5, with an average of pH 4. Excessive concentrations of manganese, copper, cobalt and sulfate are also noted with considerable amounts of iron and zinc, which can reach to toxic levels. Moreover, iron and zinc were found to be the controlling the fate of metals by precipitation and co-precipitation, due to their relatively depleted concentrations at redox shifting zones.

Key words: Küre pyritic copper ore, Bakibaba mining tunnels, volcanogenic massive sulfide ore deposits, acid production potential, neutralization potential, feasibility, groundwater chemistry