Geochemistry of icicle precipitates in tunnels in an abandoned coal mine, Korea

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Precipitates shaped like icicles are found in the ceilings and bottom of tunnels in an abandoned coal mine in Mungyeong, Gyeongsang Province, Korea. This study was carried out to understand the geochemical and mineralogical characteristics of the precipitates. The ground water leaked from the ceiling and rock fragments were sampled to measure pH and analyze Fe, Al, Mn, Ca, Mg and SO_4. The identification of minerals were assessed through XRD, SEM/EDX and FTIR. Geochemical modeling was used to simulate the precipitation of minerals. Some ground waters were acidic, which included high concentrations of Fe, Al, Ca, SO4, etc. The XRD and FTIR analysis showed that akaganeite, goethite and gypsum minerals were identified. Geochemical modeling showed that iron, aluminum hydroxide and gypsum could be produced. The place precipitates shaped like icicles were formed was basically low in leakage quantity and high salinity water quality. The evaporation caused by the natural ventilation in the underground mine seemed to have been involved in the formation of icicle precipitates.