Study of the Source of the AMD Around the Abandoned Coal Mine Related with the Groundwater

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This study was carried out to understand the source of the AMD (Acid Mine Drainage) in a coal mine and its relationship with the surrounding groundwater. Four boreholes (BH-1 ~ 4) were made around the tunnel of the Waryong-Jeongwon abandoned coal mine in Gangneung city, Gangwon-do, South Korea. Water and core samples were collected from each borehole. The core samples were separated at intervals of about 3 m and analyzed for Fe and S content by portable XRF. For water samples, pH, ORP, EC, DO were measured by portable matter and analyzed cation and anion using ICP-OES and IC. The location of the BH-1 is adjacent to the adit where the AMD is drained. This AMD is very strong acidic (pH 2.7, Fe 633mg/L, and SO_4^{2-} 3,500mg/L), but water quality showed that BH-1 groundwater (pH 6.46, low metals) was not affected by this AMD. In the case of BH-1, the level (72ML) of the high contents point of Fe (12.6%) and S (2.75%) located below the tunnel (90ML). The concentrations of Fe and Al in BH-3 and 4 were low, but were 4.95 and 5.19, respectively. So, these two boreholes seem to have been affected by AMD slightly. The water quality of the BH-2 show acidic (pH 3.73, Fe 2.55mg/L, Al 268mg/L and SO42- 2,020mg/L). In the case of the BH-2, every point of core samples near the four levels of tunnels have high contents of Fe and S (155ML Fe 1.9%, S 1.3%, 135ML Fe 3.5%, S 3.1%, 115ML Fe 2.0%, S 3.1%, 90ML Fe 3.4%, S 0.9%). From the water quality of BH-1 and BH-2 and the expected location of sulfide minerals in the strata, it could be guess that this AMD is closely related with pyrite in BH-2 but no relationship with the BH-1. This means that the AMD of the Waryong-Jeongwon coal mine is generated by the reaction of the rainwater with the pyrite distributed around the mine void and then moving along the tunnel and draining. It is thought that BH-1 groundwater, which is located at a lower water level than the tunnels, maintains the original water quality without oxidation of pyrite or mixing with the AMD.