

## Scale Composition and an Automatic Cleaning Device for pH Electrode used in Mine Drainage Treatment<sup>1</sup>

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**Abstract:** Since 2010, Korea has been operating semi-active treatments consisting of neutralization reaction tank - settling pond - wetland to neutralize some abandoned mine drainage. In this study, we tried to find out the composition of scale around pH electrodes and solve the frequent cleaning inconvenience. The pH electrode inside the neutralization reactor tank with large pollution load is vulnerable to scale formation. The pH electrode used in the neutralization reaction tank was a glass bulb electrode and the neutralizer was 20% liquid calcium hydroxide and NaOH solution. The most contaminated Ilkwang mine drainage was neutralized to pH 7 with 20% liquid calcium hydroxide and 1M NaOH solution, and pH measurement and scale formation were observed by inserting pH electrode while stirring the neutralized water in beakers. SEM-EDX analysis showed that in the vicinity of the surface of the water in beakers, gypsum was confirmed, and Fe, Al, Cu and Zn constituted scale in the lower part of the water surface. These scales can be easily washable with acid solutions. An automated system has been created to perform a suction-wash-and-preserve procedure to clean the pH electrode. In the laboratory, this cleaning system has successfully washed the pH electrode by operating at least one cycle per minute, depending on the program setting.

Additional Key Words: Semi-active Treatment, pH electrode, Mine Water

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