

# RAPID REMOVAL OF FINE PARTICLES IN MINE WATER BY USE OF COAGULATION AND FLOCCULATION PROCESS<sup>1</sup>

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**Abstract:** After the complete oxidation was conducted for coal mine drainage, the suspended particles had a very slow settling profile due to their small particle size distribution ( $d_{50}$ : 1.06  $\mu\text{m}$ ). It takes about 18 hrs to decrease the turbidity from 120 NTU to 5 NTU. In terms of engineering design, this property makes the settling system problematic since it needs a huge settling basin. In order to remove the fine particles with a fast speed, we applied the combined process of coagulation and flocculation. Polyamine-type of cationic coagulants and acryl type of anionic flocculants were selected for this study to optimize the turbidity removal process. Through fitting the kinetic data with the agglomeration rate model, kinetic study of turbidity reduction was conducted to optimize the mixing speed, types and concentrations of coagulant and flocculent. As results, the optimum chemicals and their concentrations were FL-2949 (coagulant, 10 mg/L) and A333E (flocculent, 12 mg/L). Zeta-potentials (ZP) were also measured to elucidate the flocculation mechanism for each step. Interestingly, the rate constants of turbidity removal for each combination of coagulant and flocculent were linearly correlated with the differences between ZP of flocculent-applied mine water and ZP of coagulant-applied mine water. When compared to the rate constant for mine water without any treatment, the optimized condition of coagulation and flocculation showed about 867 times higher removal speed of fine particles.

**Additional Key Words:** oxidation, neutralization, settling, pilot-scale tests

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