



Preparation and performance of fly ash-based coagulants in chemically enhanced primary treatment of domestic wastewater

Kai Hu^{a,b,*}, Qing-liang Zhao^{c,d}, Wei Chen^{a,b}, Feng Tang^c, Hang Xu^{a,b}

^aKey Laboratory of Integrated Regulation and Resource Development on Shallow Lakes, Ministry of Education, Hohai University, Nanjing 210098, P.R. China, Tel./Fax: +86 25 83786707; emails: hukaihit@163.com (K. Hu), cw5826@hhu.edu.cn (W. Chen), luconline148@163.com (H. Xu)

^bCollege of Environment, Hohai University, Nanjing 210098, P.R. China

^cSchool of Municipal and Environmental Engineering, Harbin Institute of Technology, Harbin 150090, P.R. China, Tel. +86 451 86283017; Fax: +86 25 83786707; emails: zhql1962@163.com (Q.-L. Zhao), 1572776145@qq.com (F. Tang)

^dState Key Laboratory of Urban Water Resources and Environment (SKLUWRE), Harbin Institute of Technology, Harbin 150090, P.R. China

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ABSTRACT

Fly ash was adopted to prepare a composite coagulant containing Al and Fe salts by acid leaching. The concentrations of Al and Fe salts in the coagulant and the conversion efficiencies of Al and Fe oxides in fly ash are strongly affected by L/S ratio (defined as the ratio of volume of acid solution to mass of fly ash, ml/g), reaction temperature, and H₂SO₄ concentration. At L/S ratio of 3 ml/g, H₂SO₄ concentration of 4 mol/L, the prepared fly ash-based coagulant after heating and cooling of 0.5 h achieves maximum concentrations of 0.137 mol/L Al³⁺ and 0.0464 mol/L Fe³⁺ + Fe²⁺. At a dosage of 3.2 ml/L, coagulation of domestic wastewater results in removal efficiencies of 92% SS, 65% COD, and 98% PO₄³⁻-P. The prepared coagulant proves to be an effective agent in terms of pollutant removal and exhibits comparable performance with conventional and polymer Al and Fe coagulants. This could be ascribed to charge neutralization by Al and Fe salts, and bridging effect with the aid of solubilized silicic acid and residual particles.

Keywords: Composite coagulant; Fly ash; Chemically enhanced primary treatment; Domestic wastewater

*Corresponding author.