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Assessment of expired coagulant for water treatment

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Abstract

The water treatment process plays an important role to supply clean and safe water for human consumption and other daily usages. Coagulation is an important part of potable water treatment plants. Various types of coagulants are used in the water treatment industries; poly-aluminium chloride (PAC) is one of the favourite ones. Sometimes, such coagulants may expire due to various reasons. This paper aimed to assess the effectiveness of an expired PAC in reducing turbidity from water. Effects of various processes on the optimum dosage of the expired coagulant were investigated. As the economy of the coagulation-flocculation process depends on the optimum dose of coagulant, studying the effects of various parameters on the coagulant dosage is important. The parameters studied included water turbidity, pH value, mixing speed, sample volume and settling time after the mixing process. The tests were conducted using standard jar apparatus. The test results revealed that the expired PAC lost its coagulation and flocculation ability significantly. In general, the expired PAC could remove the turbidity by about 50% of the initial turbidity, although the effect of variation in PAC dose was absent. For the expired PAC, a pH of 5.9 was more suitable to reduce turbidity compared to higher pH of 8.2. A low mixing rate of 60 and 120 rpm was more suitable in removing turbidity compared to a high mixing rate of 200 rpm. Test results also revealed that the turbidity removal behaviour of the expired coagulant did not follow any trend when it was tested to study the effects of sample volume, mixing speed, and settling time after coagulation. Although the expired PAC still had some flocculation activity, it is not recommended to be used in potable water treatment without further investigation on the health and safety aspects of the coagulant. However, the expired PAC still can be used to settle solids and sludge from the wastewater instead of throwing them away as waste. © 2023 Author(s).

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