

ABSTRAK

Pencemaran mikroplastik di Sungai Batanghari telah meningkat akibat aktivitas domestik dan industri yang intensif, menyebabkan gangguan ekosistem serta potensi risiko kesehatan manusia. Mikroplastik berukuran <5 mm sulit terurai secara alami dan berpotensi menyerap senyawa berbahaya di lingkungan perairan. Penelitian ini dilakukan untuk mengevaluasi kemampuan metode koagulasi-flokulasi dalam mendegradasi mikroplastik, serta membandingkan efektivitas dua jenis koagulan—Aluminium Sulfat ($\text{Al}_2(\text{SO}_4)_3$) dan Poly Aluminium Chloride (PAC)—dalam proses penyisihan partikel mikroplastik dari air Sungai Batanghari.

Penelitian dilaksanakan secara eksperimental menggunakan metode *jar test* dengan variasi dosis koagulan 10, 30, 60, dan 100 mg/L. Sampel air diambil dari Sungai Batanghari, kemudian dilakukan analisis terhadap jenis, bentuk, warna, dan ukuran mikroplastik sebelum serta sesudah perlakuan. Proses degradasi dikaji melalui penurunan jumlah partikel dan perubahan karakteristik kimia mikroplastik yang dianalisis menggunakan Fourier Transform Infrared Spectroscopy (FTIR) untuk mengidentifikasi polimer hasil pengolahan.

Hasil menunjukkan bahwa jenis mikroplastik yang dominan adalah fiber, fragmen, filamen, dan pellet. Proses koagulasi-flokulasi efektif menurunkan kandungan mikroplastik dengan efisiensi tertinggi pada dosis 60–100 mg/L. Aluminium Sulfat menunjukkan kinerja terbaik dengan efisiensi penyisihan 96,17%, sedangkan PAC mencapai 95%. Analisis FTIR memperlihatkan perubahan gugus fungsi pada polimer Polyethylene (PE), Polypropylene (PP), dan Polystyrene (PS). Secara keseluruhan, metode koagulasi-flokulasi terbukti efektif untuk mendegradasi mikroplastik dan berpotensi diterapkan dalam sistem pengolahan air skala lapangan.

Kata kunci: Mikroplastik, degradasi, koagulasi-flokulasi, Aluminium Sulfat, PAC, Sungai Batanghari.

ABSTRACT

Microplastic pollution in the Batanghari River has increased due to intensive domestic and industrial activities, causing ecosystem disruption and potential risks to human health. Microplastics measuring <5 mm are difficult to break down naturally and have the potential to absorb harmful compounds in the aquatic environment. This study was conducted to evaluate the ability of the coagulation-flocculation method to degrade microplastics, as well as to compare the effectiveness of two types of coagulants—Aluminum Sulfate ($Al_2(SO_4)_3$) and Poly Aluminum Chloride (PAC)—in the process of removing microplastic particles from the water of the Batanghari River.

The research was conducted experimentally using the jar test method with coagulant doses varying between 10, 30, 60, and 100 mg/L. Water samples were taken from the Batanghari River, then analyzed for the type, shape, color, and size of microplastics before and after treatment. The degradation process was assessed through a decrease in the number of particles and changes in the chemical characteristics of microplastics, which were analyzed using Fourier Transform Infrared Spectroscopy (FTIR) to identify the polymers resulting from processing.

The results show that the dominant types of microplastics are fibers, fragments, filaments, and pellets. The coagulation-flocculation process effectively reduces microplastic content with the highest efficiency at a dose of 60–100 mg/L. Aluminum sulfate showed the best performance with a removal efficiency of 96.17%, while PAC achieved 95%. FTIR analysis showed changes in the functional groups of Polyethylene (PE), Polypropylene (PP), and Polystyrene (PS) polymers. Overall, the coagulation-flocculation method proved to be effective in degrading microplastics and has the potential to be applied in field-scale water treatment systems.

Keywords: *Microplastics, degradation, coagulation-flocculation, aluminum sulfate, PAC, Batanghari River.*