

ABSTRAK

Penurunan Kadar Surfaktan Air Limbah *Laundry* Menggunakan Fotokatalis ZnO-NiFe₂O₄ dengan Variasi Massa Katalis dan Waktu Kontak
(Anya Berlian Rahmadani, 2026, 67 Halaman, 9 Tabel, 12 Gambar, 4 Lampiran)

Limbah *laundry* merupakan salah satu sumber pencemaran lingkungan yang mengandung senyawa organik, surfaktan, dan fosfat yang dapat menurunkan kualitas perairan. Salah satu metode yang dapat digunakan untuk mengolah limbah *laundry* adalah fotokatalisis menggunakan komposit ZnO-NiFe₂O₄. Penelitian ini bertujuan untuk mengetahui karakteristik fotokatalis ZnO-NiFe₂O₄ serta pengaruh variasi massa katalis dan waktu kontak terhadap penurunan kadar pencemar pada limbah *laundry*. Metode penelitian meliputi sintesis fotokatalis ZnO-NiFe₂O₄ dan pengujian aktivitas fotokatalitik menggunakan variasi massa katalis 0,5; 0,75; 1; 1,25; dan 1,5 gram serta waktu kontak 0, 60, 120, 180, dan 240 menit. Hasil karakterisasi ZnO-NiFe₂O₄ menunjukkan ukuran kristal sebesar 24,98 nm. Analisis FTIR menunjukkan adanya pita serapan pada bilangan gelombang 455 cm⁻¹ yang berkaitan dengan ikatan Zn-O/Ni-O dan 580 cm⁻¹ yang berkaitan dengan ikatan Fe-O, sehingga mengonfirmasi terbentuknya komposit ZnO-NiFe₂O₄. Evaluasi aktivitas fotokatalis dilakukan melalui analisis *Chemical Oxygen Demand* (COD), surfaktan, dan fosfat. Hasil penelitian menunjukkan kondisi optimum diperoleh pada massa katalis 1,5 gram dan waktu kontak 180 menit dengan persentase penurunan COD sebesar 68,97%, penurunan kadar surfaktan sebesar 93,52%, dan penurunan kadar fosfat sebesar 98,55%.

Kata Kunci : ZnO, NiFe₂O₄, Fotokatalis, Limbah *Laundry*, Surfaktan

ABSTRACT

Reduction of Surfactant Concentration in Laundry Wastewater Using ZnO-NiFe₂O₄ Photocatalyst with Variations in Catalyst Mass and Contact Time
(Anya Berlian Rahmadani, 2026, 67 Pages, 9 Table, 12 image, 4 Appendices)

Laundry wastewater is one of the sources of environmental pollution containing organic compounds, surfactants, and phosphates that can reduce water quality. One method that can be applied to treat laundry wastewater is photocatalysis using a ZnO-NiFe₂O₄ composite. This study aimed to determine the characteristics of the ZnO-NiFe₂O₄ photocatalyst and to investigate the effect of catalyst mass and contact time on the reduction of pollutants in laundry wastewater. The research method included the synthesis of ZnO-NiFe₂O₄ photocatalyst and photocatalytic activity testing using catalyst mass variations of 0.5, 0.75, 1.0, 1.25, and 1.5 g, with contact times of 0, 60, 120, 180, and 240 minutes. The characterization results showed that the ZnO-NiFe₂O₄ photocatalyst had a crystallite size of 24.98 nm. FTIR analysis revealed absorption bands at 455 cm⁻¹ associated with Zn–O/Ni–O bonds and at 580 cm⁻¹ associated with Fe–O bonds, confirming the successful formation of the ZnO-NiFe₂O₄ composite. The photocatalytic activity was evaluated through Chemical Oxygen Demand (COD), surfactant, and phosphate analyses. The results indicated that the optimum condition was achieved at a catalyst mass of 1.5 g and a contact time of 180 minutes, resulting in COD removal of 68.97%, surfactant removal of 93.52%, and phosphate removal of 98.55%.

Keywords: ZnO, NiFe₂O₄, Photocatalyst, Laundry Wastewater, Surfactant.