

No. TA 1345/S1-TL/0826-P

**FABRIKASI LEMBARAN ALUMUNIUM TERAKTIVASI ALKALIS
UNTUK PENYISIHAN *ESCHERICHIA COLI*
PADA AIR MINUM**

TUGAS AKHIR

Oleh:

TIFFANY DAVIS
2210943012



**PROGRAM STUDI SARJANA TEKNIK LINGKUNGAN
DEPARTEMEN TEKNIK LINGKUNGAN
FAKULTAS TEKNIK - UNIVERSITAS ANDALAS
PADANG**

2026

ABSTRAK

Air minum yang aman merupakan kebutuhan dasar, namun kontaminasi *Escherichia coli* masih menjadi masalah kesehatan masyarakat, terutama pada air minum rumah tangga dan depot air minum isi ulang. Penelitian ini bertujuan memfabrikasi *Alkali-Treated Aluminium Foil* (ATA foil) menggunakan aluminium foil komersial, Pupuk $Mg(NO_3)_2$, dan pupuk wood ash/abu kayu, serta mengevaluasi efektivitasnya dalam menyisihkan *E. coli* pada air minum. ATA foil disintesis secara *in situ* melalui variasi waktu fabrikasi 6 jam dan 24 jam. Karakterisasi material dilakukan menggunakan *X-Ray Diffraction* (XRD), *Scanning Electron Microscopy* (SEM), dan *Energy Dispersive X-Ray* (EDX) untuk mengidentifikasi kristalinitas, morfologi permukaan, dan komposisi unsur. Uji kinerja dilakukan pada sampel air artifisial yang diinokulasi *E. coli* dan sampel nyata dari Depot Air Minum Isi Ulang (DAMIU), kemudian dianalisis berdasarkan jumlah *Colony Forming Unit* (CFU). Hasil penelitian menunjukkan bahwa lapisan aktif berbasis aluminium hidroksida berhasil terbentuk pada permukaan aluminium foil. Variasi fabrikasi ATA Foil 24 jam menghasilkan morfologi permukaan lebih berkembang dan kinerja penyisihan *E. coli* lebih baik dibandingkan variasi ATA Foil 6 jam. ATA foil mampu menurunkan konsentrasi *E. coli* secara signifikan pada kedua jenis sampel. Selain itu, pengujian aluminium terlarut menunjukkan tidak adanya pelepasan aluminium yang terdeteksi pada air hasil perlakuan, sehingga memenuhi standar kualitas air minum. Temuan ini mendukung pemanfaatan reagen lokal sebagai bahan inovatif yang mudah diperoleh untuk aplikasi lapangan. Dengan demikian, ATA foil berpotensi menjadi teknologi *point-of-use* yang sederhana, ekonomis, aman, dan efektif untuk penyisihan bakteri *E. coli* pada air minum.

Kata kunci: ATA foil, adsorpsi, aluminium hidroksida, *Escherichia coli*, Penyisihan bakteri *E.coli*



ABSTRACT

Safe drinking water is a basic human necessity; however, contamination by *Escherichia coli* remains a major public health concern, particularly in household drinking water and refill drinking water depots. This study aimed to fabricate Alkali-Treated Aluminium Foil (ATA foil) using commercial aluminum foil, $Mg(NO_3)_2$ fertilizer, and wood ash as a local alkaline reagent, and to evaluate its effectiveness in removing *E. coli* from drinking water. ATA foil was synthesized in situ using fabrication times of 6 hours and 24 hours. Material characterization was performed using X-ray diffraction (XRD), Scanning Electron Microscopy (SEM), and Energy-Dispersive X-ray Spectroscopy (EDX) to determine the crystallinity, surface morphology, and elemental composition of the fabricated material. Performance evaluation was conducted using artificial water inoculated with *E. coli* and real samples collected from refill drinking water depots (DAMIU), with bacterial concentrations determined by the Colony Forming Unit (CFU) method. The results showed that an active aluminum hydroxide-based layer was successfully formed on the surface of the aluminum foil. The ATA foil fabricated for 24 hours exhibited a more developed surface morphology and superior *E. coli* removal performance than the ATA foil fabricated for 6 hours. ATA foil effectively reduced *E. coli* concentrations in both artificial and real water samples. Furthermore, dissolved aluminum analysis indicated that no detectable aluminum was released into the treated water, demonstrating compliance with drinking water quality standards. These findings highlight the potential of locally available reagents as innovative and accessible materials for practical water treatment applications. Therefore, ATA foil has considerable potential as a simple, economical, safe, and effective point-of-use technology for the removal of *E. coli* from drinking water.

Keywords: ATA foil, adsorption, aluminum hydroxide, *Escherichia coli*, *E. coli* removal

