

Zn-Al Layered Hydroxide Foam for Dye Effluent Remediation

Technology Domain: Polymer Technology

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Technology Summary:

This invention introduces a novel Zn-Al layered double hydroxide (LDH) infused microporous polyurethane foam for efficient textile effluent treatment. The key technical solution involves a specific composite material where Zn-Al LDH nanostructures (0.1-0.5 wt%) are uniformly blended into a polyol composition (containing polyether polyol, surfactant, catalyst, and water as a blowing agent), which is then reacted with an isocyanate (45-60 wt%) to form the microporous foam. The key inventive feature is the successful integration of Zn-Al LDH within the polyurethane foam matrix, enabling a dual mechanism of adsorption and photocatalytic degradation of textile dyes.

Results demonstrate the foam's effectiveness in degrading various synthetic dyes like methyl violet, Eriochrome Black T, and methyl orange, as evidenced by UV-Vis spectroscopy showing significant color reduction over time. The use of this composite foam provides an improved, economical, and environmentally friendly approach for treating textile wastewater, addressing the critical need for efficient removal of harmful chemicals and dyes from industrial effluents.

