

Transforming Clay and Marble Waste into High-Performance Ceramic Membranes for Textile Effluent Microfiltration

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Abstract: This study focuses on the development of an eco-friendly and low-cost flat ceramic microfiltration membrane based on the valorization of marble waste powder and natural clay. The membrane was fabricated and optimized using a statistical experimental design approach (Doehlert matrix) within the framework of response surface methodology, allowing the systematic evaluation of the main processing parameters. The optimized membrane exhibited a favorable combination of mechanical strength, porosity, permeability, and chemical stability, particularly in alkaline environments. When applied to real industrial wastewater, the membrane demonstrated high treatment efficiency, especially in turbidity and organic matter removal. Overall, the results highlight the strong potential of this sustainable ceramic membrane as an effective and environmentally friendly alternative for industrial wastewater treatment applications.

Keywords: Clay, Marble, Ceramic membrane, Microfiltration Optimization, Experimental design.

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