World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:18, No:09, 2024

Coal Fly Ash Based Ceramic Membrane for Water Purification via Ultrafiltration

Authors : Obsi Terfasa, Bhanupriya Das, Shiao-Shing Chen

Abstract : Converting coal fly ash (CFA) waste into ceramic membranes presents a promising alternative to traditional disposal methods, offering potential economic and environmental advantages that warrant further investigation. This research focuses on the creation of ceramic membranes exclusively from CFA using a uniaxial compaction technique. The membranes' properties were examined through various analytical methods: Scanning Electron Microscopy (SEM) revealed a porous and flawless membrane surface, X-Ray Diffraction (XRD) identified mullite and quartz crystalline structures, and Fourier-Transform Infrared Spectroscopy (FTIR) characterized the membrane's functional groups. Thermogravimetric analysis (TGA) determined the ideal sintering temperature to be 800°C. To evaluate its separation capabilities, the synthesized membrane was tested on wastewater from denim jeans production at 0.2 bar pressure. The results were impressive, with 97.42% removal of Chemical Oxygen Demand (COD), 95% color elimination, and a pure water flux of 4.5 $Lm^{-2}h^{-1}bar^{-1}$. These findings suggest that CFA, a byproduct of thermal power plants, can be effectively repurposed to produce ultrafiltration membranes suitable for various industrial purification and separations.

Keywords : wastewater treatment, separator, coal fly ash, ceramic membrane, ultrafiltration
Conference Title : ICCMME 2024 : International Conference on Chemical, Materials and Metallurgical Engineering
Conference Location : Toronto, Canada
Conference Dates : September 19-20, 2024