Modified Melamine Foams for Oil/Water Separation

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INTRODUCTION

The effective management of wastewater is a critical environmental concern, particularly in terms of separating oil and water components. In this study, melamine foams were chemically modified using ferric chloride to achieve a superhydrophobic surface (150° WCA, achieved) for efficient oil/water separation. Commercial melamine foams were selected for their cost-effectiveness, availability, mechanical and chemical stability, and high sorption capacity. Through the modification process, the foams' hydrophilicity was hindered by forming a metal complex with ferric chloride ions. Subsequently, these modified foams were employed to separate various oil in water systems with increasing complexity, including diesel oil emulsion, synthetic produced water, and oil/water mixtures with high oil content (up to 40%)

RESULTS

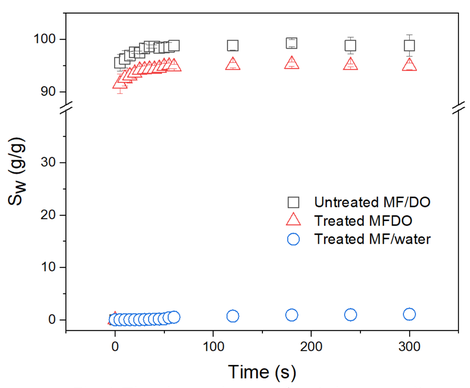

Fig.1.The dependence of uptake capacity (Sw) on time

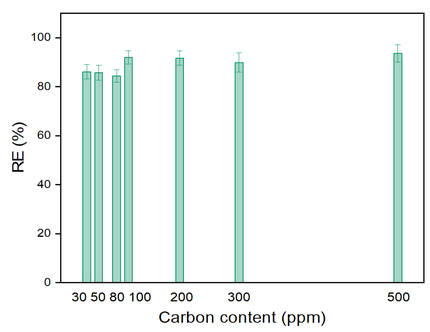

Fig.2.The dependence of removal efficiency (RE) on the initial concentration of DO emulsion

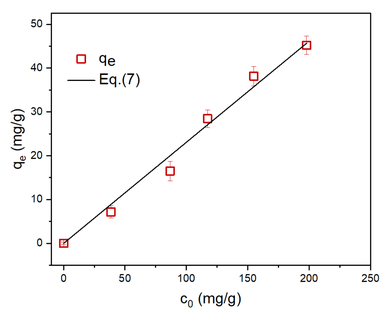

Fig.3.The dependence of the adsorption capacity (qe) on the initial concentration of oil

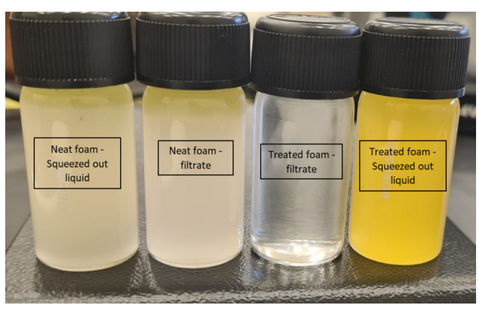

Fig.4.Photograph of the o/w mixture before and after absorption by MF foams

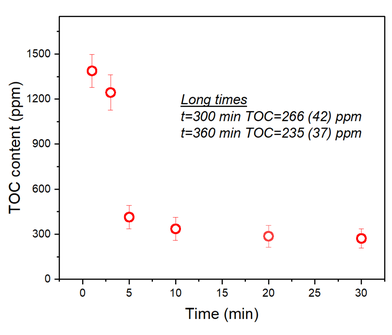

Fig.5.Kinetics of demulsification

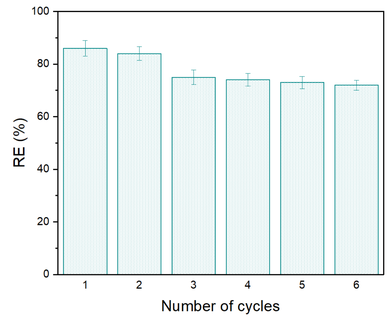

Fig.6.The MF removal efficiency of PW for six constrictive cycles

CONCLUSION

The study investigated the use of melamine foams modified by ferric chloride for the treatment of water polluted by oil, including emulsions, mixtures, and free oil. The modified foams demonstrated high efficiency in separating oil from water, with a 91.4% efficiency in separating emulsions containing 100 ppm of diesel oil, 86% separation efficiency for produced water emulsions, and a 99.9% efficiency in separating mixtures containing 20 and 40 weight % of oil. The foams also rapidly removed free oil from the water surface, with a high absorption capacity of 95 g/g DO. The study demonstrated the potential of modified melamine foams as an efficient approach for treating emulsified water containing oily impurities in a colloidal state.

ACKNOWLEDGEMENT

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