FISA: Film for Selective Absorption

Muller, Rafssa
Chiomento da Motta, Gabriel

According to ITOPF (International Tanker Owners Pollution Federation), a total of 6.75 billion liters of oil was spilled in the oceans since the 1970's. Oil affects the base of the aquatic ecosystem, causing widespread death of the marine life. Current systems of oil spills containment have limited action. Due to this the development of a porous material with nonpolar character is a sustainable and economically viable alternative. After studying many porous materialscryptomelane was chosen to be used as an alternative to absorption of oil spills in general, avoiding soil and water contamination. The cryptomelane film was obtained from $MnSO_4.H_2O$, HNO_3 and $KMnO_4$ solution, which was refluxed for 24 hours. The cryptomelane film was left in contact with NH_4Cl solution to enable ionic exchange of K^+ ions with NH_4^+ and subsequently brought to the muffle furnace at 600oC, temperature that decomposes ammonium into nitrogen, increasing the porosity of the film. Furthermore, the film was coated with silicon vapor, at a temperature of 234oC so that the silicone chain fragments could be deposited onto the film, making it hydrophobic. The developed film presented oil absorption capacity of 8 to 15 times of its own volume, with the possibility of reusing the material for several absorptions, recovering the absorbed liquid, with an efficiency of over 90%. It can also be used with a non-woven tissue covering in order to ease its use. The material produced not only represents a method of reusing the spilled oils as well as a more efficient protection of the marine and terrestrial biomes, being an alternative to replace the existing methods.

Awards Won:
Second Award of $2,000