Utilizing Polyurethane Foam and Nano-Activated Carbon-Based Composite for Sustainable Eco-Friendly Oil Spill Remediation

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Oil spills constitute a serious threat to both the economy and the environment, disturbing the ecosystem. According to the International Tanker Owners Pollution Federation Limited (ITOPF) in 2023, approximately 2,000 tonnes of oil were lost to the environment from tanker spills. This study introduces an innovative solution for oil spill remediation. A new composite of hydrophobic wasted flexible polyurethane foam (Pu), polystyrene foam, rigid polyurethane foam, nano-activated carbon (AC) derivative from wasted graphite, and polypropylene fabric was developed to form Pu AC Boom. The laser diffraction particle size analyzer indicated that the activated carbon's particle size was in the nano range after using the ball mill. Rigid polyurethane was bonded to the nano-activated carbon physically which was verified by SEM and XRD confirmed the formation of the microcrystalline structure. It was concluded by experiments that the absorption capacity of Pu AC Booms was 10,000 mg/g where it absorbed up to 10 times its weight within 25 minutes at the optimal conditions, in addition to 45 min of mechanical separation. So, cleaning up the entire spill took an average of 70 minutes, giving 96% removal. Furthermore, Pu AC Boom was reusable for up to 4 cycles while maintaining the same efficiency. Pu AC Boom can be disposed of by combustion, converting it into activated carbon for reuse. EDX and SEM confirmed the presence of activated carbon throughout the burnt composite. These results suggest that Pu AC Boom is a sustainable, cost-effective eco-solution that enhances the efficiency of oil spill remediation.

Awards Won:
Third Award of $1,000
King Abdulaziz &amp
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King Abdulaziz &amp
his Companions Foundation for Giftedness and Creativity: NOT TO BE READ -- $400 cash prize for each Full Scholarship from King Fahd University award recipient