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Biocarbons as emerging and sustainable hydrophobic/oleophilic sorbent materials for oil/water separation(Review)

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Abstract

Oil/water separation receives increasing interest as the oil contaminants level has been continuously increasing in the water resources in most of parts of the world and is being considered as a severe environmental threat to the society. As the result, a wide range of methods have been investigated in order to minimize the oil-based contaminants (including non-polar organic solvents which are immiscible in water) in water resources, where sorption process has been widely accepted owing to their easy handling, rapid, low-cost, harmless and efficient large-scale approach. Out of the sorbents explored, carbon-based materials gained more interest in oil/water separation because of their superior physicochemical properties as well as structural advantages. The recent advancement in the carbon-based oil/water separation technology is the exploration of various renewable resource-based biocarbon materials as green and sustainable approach and their modifications to enhance the sorption properties. The advantages of renewable- biocarbon materials are, vast availability and diversity of resources with wide-range of chemical compositions, tuning/predicting the structures by choosing specific precursors and flexible structural/chemical modifications to improve the properties. Thus, the present review deals with reported biocarbon-based hydrophobic/oleophilic materials such as biochar, activated biocarbon, biocarbon fibers, biocarbon aerogels and biocarbon-based composite materials as sorbents for oil/water separation, as well as oil spill cleanup from water resources. In detail, various synthetic procedures of biocarbon materials and their physicochemical characteristics (hydrophobicity/oleophilicity, wettability, water/oil contact angle, etc.) are discussed in this review.

Author keywords

Biocarbon | Hydrophobic | Oil/water separation | Oleophilic | Sorption | Water pollution

Indexed keywords

Engineering controlled terms: Aerogels | Carbon | Chemical modification | Contact angle | Hydrophobicity | Oil spills | Petroleum prospecting | Physicochemical properties | Separation | Sorption | Water resources

Engineering uncontrolled terms: Carbon based materials | Chemical compositions | Environmental threats | Oil/water separation | Physicochemical characteristics | Sorption properties | Structural advantage | Synthetic procedures

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