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Carbon nanotubes grown on oil palm shell powdered activated carbon as less hazardous and cheap substrate (Article)

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Abstract

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Multiwall carbon nanotubes were synthesised using fixed catalyst in a chemical vapor deposition reactor. The reactor system was locally built and used to grow carbon nanotubes (CNTs) on oil palm shell powdered activated carbon (PAC). The PAC was impregnated with Fe³⁺ catalyst through sonication process. The nano-micro composite produced in this study was named as "CNT-PAC". Acetylene (C₂H₂) gas was used as carbon source compared to the use of toxic hydrocarbons such as benzene (C₆H₆). Synthesis parameters such as gas flow rates, temperature and reaction time were varied for high yield of the CNTs on powdered activated carbon. The CNT-PAC samples were characterized using field emission electron microscope and transmission electron microscope to confirm the growth of CNT as well as to study the morphology of the nano product. Selected well-grown CNT-PAC were further characterized using Fourier transform infrared spectroscopy, thermal gravimetric analysis and BET surface area measurement. The results showed that BET surface area was improved from 101.1 to 974.9 m²/g. The Zeta potential was – 46.1 mV. The zeta potential of the nano-micro composite indicated that the material will be in good dispersion in aqueous solution. The CNT-PAC product was also oxidized using KMnO₄ to functionalise various radicals on the surfaces. The product could be potential as an adsorbent for gaseous and aqueous pollutants due to its high surface area and the presence of various functional groups. © 2018, Springer-Verlag GmbH Germany, part of Springer Nature.

Author keywords

[Adsorbent](#) [Catalyst impregnation](#) [Chemical vapor deposition](#) [Functional groups](#) [Nanotechnology](#)
[Powdered activated carbon](#)

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