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Research Article

The Adsorption Properties of *Bacillus atrophaeus* Spores on Single-Wall Carbon Nanotubes

P. Cortes,¹ S. Deng,² and G. B. Smith³¹Department of Mechanical & Aerospace Engineering, New Mexico State University, Las Cruces, NM 88003, USA²Department of Chemical Engineering, New Mexico State University, Las Cruces, NM 88003, USA³Department of Biology, New Mexico State University, Las Cruces, NM 88003, USA

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Abstract

An adsorption equilibrium and a kinetic study of *Bacillus atrophaeus* on Single-Wall Carbon Nanotubes (SWCNTs) were here performed to provide the basis for developing biosensor devices for detecting threatening microorganisms in water supply systems. *B. atrophaeus* spores and carbon nanotubes were subjected to a batch adsorption process to document their equilibria and kinetics. Here, commercial nanotubes were either studied as received or were acid-purified before adsorption experiments. The *Bacillus* spores appear to show higher affinity towards the purified nanotubes than to the as-received nanomaterial. The effective diffusivity of the spores onto the purified nanotubes was found to be approximately 30 percent higher than onto the as-received nanotubes. It seems that the removal of amorphous carbon from the as-received nanotubes through a purification process yielded an intimate nanotubes-spore interaction as revealed by transmission electron microscopy. Freundlich model successfully correlated the adsorption equilibrium data for the nanotubes-spore interaction. Transmission electron micrographs showed extensive contact between the *Bacillus* and the purified nanotubes, but the association appeared less intimate between the spores and the as-received nanotubes.

Abstract

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