Physical and anti-microbial characteristics of carbon nanoparticles prepared from lamp soot

B Mohanty, AK Verma, P Claesson, HB Bohidar

Nanotechnology, 2007 • iopscience.iop.org

Abstract

Soot originating from the burning of butter and mustard oil in a lamp with a cotton wick was collected on a brass plate and dispersed in water and carbon tetrachloride (CCl 4) as naked, and as Gum Arabic (GA, a anionic polyelectrolyte)-coated nanoparticles in water. They were physically characterized, and their anti-bacterial activities were probed on gram positive and negative bacterial colonies. TEM data revealed the presence of 35–55 nm diameter spherical carbon nanoparticles in water and CCl 4. The dynamic light scattering determined the average hydrodynamic diameter for the same samples, which was found to be≈ 100 nm (in CCl 4) and≈ 240 nm (in water), implying the packing of these nanoparticles into clusters. GA-coated particles yielded stable suspensions in water, but the clusters were almost the same in size (≈ 250 nm). The zeta potential distributions of the naked and the GA-coated nanoparticles were found to be unimodal and bimodal, respectively, with both yielding mean zeta potential values nearly equal to zero. Results of energy-dispersive x-ray analysis (EDAX) confirmed the absence of toxic metallic elements inside the specimen. X-ray diffraction study confirmed the presence of amorphous as well as graphitized carbon in these nanostructures. The anti-microbial activities in terms of growth inhibition for the carbon nanoparticles against Staphylococcus aureus, ATCC 13709 (native strain) and Klebsiella pneumonia ATCC 29655 (native strain) were assayed in agar gel. In vitro testing revealed significant anti-microbial activity against Klebsiella pneumonia, but carbon nanoparticles were unable to kill Staphylococcus aureus.

iopscience.iop.org

SHOW LESS