Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Assembly of Acid-Functionalized Single-Walled Carbon Nanotubes at Oil/Water Interfaces TAO FENG, DAVID HOAGLAND[1], THOMAS RUSSELL[2], University of Massachusetts at Amherst — The segregation of water-soluble acid-functionalized single-walled carbon nanotubes (SWCNTs) at the oil/water interface was induced by dissolving low-molecular-weight amine-terminated polystyrene (PS-NH2) in the oil phase. Salt-bridge interactions between carboxylic acid groups of SWCNTs and amine groups of PS drove assembly of a mixed interfacial film, monitored by pendant drop tensiometry and laser scanning confocal microscopy. The influence of PS end-group functionality, PS and SWCNT concentrations, and degree of SWCNT acid modification on interfacial activity were assessed, and a sharp drop in interfacial tension was observed above a critical SWCNT concentration. Interfacial tensions were low enough to support stable oil/water emulsions. Further experiments, including potentiometric titrations and replacement of SWCNTs by other carboxyl-containing species, demonstrated that the interfacial tension drop reflects the loss of SWCNT charge as pH falls near/below the intrinsic carboxyl dissociation constant; species lacking multivalent carboxylic acid groups are inactive. The interfacial assemblies of SWCNTs appear neither ordered nor oriented.

[1]Research Advisor
[2]Advisor

Tao Feng
University of Massachusetts at Amherst

Date submitted: 13 Nov 2013 Electronic form version 1.4