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Electronic separation of dispersed carbon nanotubes in solution by Lorentz forces CHARISHMA SUBBAIAH, JOSHUA WOOD, JOSEPH LYDING, University of Illinois at Urbana-Champaign — Use of single-walled carbon nanotubes (SWNTs) in industry compatible device applications requires top-down control of SWNT electronic type. Therefore, we develop a technique for SWNT electronic separation, increasing the relative distribution of metallic SWNTs in solution by a magnetically induced Lorentz force. We take solutions of SWNTs in n-methylpyrrolidone and sonicate them, making a disperse solution on which we apply a non-uniform voltage waveform. This waveform generates a magnetic field that couples more strongly with metallic SWNTs than semiconducting SWNTs, due to a higher metallic SWNT magnetic moment, separating the tubes by Lorentz force. By conducting SWNT spectrophotometric measurements in the UV-vis-IR region, we assess the separation effectiveness. From the extracted supernatant solution, we observe a multi-fold absorbance enhancement in the metallic SWNT transition regions [1]. Additionally, the small full-width at half maximum in the absorbance peaks suggests that we are selecting a small number of metallic chiralities in our separation.

[1] Ausman et al., J. Phys. Chem. B. 104, 8911 (2000).

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