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Designing of Single Walled Carbon Nanotubes dispersions for industrial scale processing and roll-to-roll coating applications BUDHADIPTA DAN, MATTEO PASQUALI, Rice University — Carbon nanotubes (CNTs) combine nanoscale size with high aspect ratio and unique properties, making them ideal candidate materials for high-impact applications. Yet, much as in polymer science and engg, such applications require appropriate fluid based dispersions which can undergo industrial processing that translate the properties of elemental molecules (SWNTs) into macroscopic materials. We report a detailed study on the flow behavior of aqueous SWNT dispersions involving surfactants, its dependence on SWNT & surfactant concentration, and type of surfactant. We also design a SWNT dispersion for use in industrial roll-to-roll (rod based) thin film coating process. Purified, pristine SWNTs were dispersed in water at high concentrations using surfactants and analyzed using rheology and optical microscopy. A SWNT-SDBS-TritonX100 dispersion was found to have the appropriate viscoelastic and shear thinning behavior for rod coating. Rod coating, washing and sulfuric acid treatment resulted in highly uniform thin films of pure SWNT (sheet resistance of 100 and 300 Ω/sq for respective transparency of 70% and 90%). The results presented here, both in terms of scientific understanding of how to control fluid and process, and in terms of a scalable technique, paves the way to the deployment of transparent conductive SWNT films in large scale commercial applications.

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