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Phase behavior of SWNT-superacid solutions and fabrication of aligned macrostructures BUDHADIPTA DAN, MATTEO PASQUALI, Rice University — Single-wall carbon nanotubes (SWNTs) are carbon based molecules which possess very high aspect ratio, high persistence length and behave as rigid rods when dispersed in a liquid phase. Superacids (oleum, chlorosulfonic acid etc) have been shown as one of the most effective solvents for dispersing and dissolving SWNTs. The SWNT-superacid systems exhibit a very rich phase behavior with well defined isotropic, bi-phasic and liquid crystalline phases, and controlled by factors like the SWNT concentration, SWNT length and strength of the acid (solvent). We report the fabrication of SWNT macrostructures with high degree of alignment by self assembly and exploiting the phase behavior of SWNT-superacid solutions. Phase transitions were induced in SWNT-superacid solutions in a controlled manner by gradually changing the strength of the acid solvent. This resulted in the precipitation of SWNT flakes and fibrils which exhibit a high degree of alignment. Detailed characterization of these macrostructures was performed using Raman spectroscopy and polarized optical microscopy. The above method presents a self-assembly based route for fabrication of aligned SWNT based structures from SWNT-superacid systems.

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