

FROM CARBON TO COPPER: STUDIES OF NOVEL NANOMATERIALS

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ABSTRACT

Nanomaterials are materials on the order of 10^{-9} m that are currently being investigated for use in a wide range of applications in the growing field of nanotechnology. This dissertation documents the synthesis, characterization, and applications of two particular types of nanomaterials: single-walled carbon nanotubes and copper-based coordination polymers. The synthesis of single-walled carbon nanotube gels and foam is detailed, and a series of techniques including scanning electron microscopy, infrared spectroscopy, differential scanning calorimetry, and viscometry were employed to learn more about the properties of the gels and foam. Methane sorption studies were performed using the gel, and there is a potential use for the foam in composite materials as well. Single crystal X-ray diffraction was used to determine the structures of various Cu(I) and Cu(II) coordination polymers. The thermal stability of the coordination polymers was studied by thermal gravimetric analysis. The seven different structures reported are compared, and their potential applications are also discussed.