289n Conceptual Design of Continuous Processes for Carbon Nanotubes Based on Total Cost and Life-Cycle Assessment

Ralph W. Pike, Adedeji Agboola, Helen H. Lou, Jack R. Hopper, and Carl L. Yaws

If processes to manufacture carbon nanotubes are going to be commercially successful, they must be designed to satisfy economic, environmental and sustainable requirements. Two catalytic, chemical vapor deposition processes (HiPCO and CoMoCat) for carbon nanotube were selected for conceptual designs of continuous large–scale production processes based on life cycle assessment and sustainable development criteria. These processes use catalytic reactors operated at a high temperature (>800oC) and are energy intensive. The purification steps involve using high concentration mineral acids, and there are liquid and solid wastes that must be treated. Consequently, these potentially new processes have all of the difficulties associated with existing chemical processes, and total cost and life cycle assessment methods are described to have these processes be economically viable and environmentally acceptable.