Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Hierarchical 3D microstructures from pyrolysis of epoxy resin MICHAEL DE VOLDER, DOMINIEK REYNAERTS, KULeuven, CHRIS VAN HOOF, IMEC, A. JOHN HART, University of Michigan — Nature is replete with examples of microscale dendrites connected to tree-like backbones ranging from the overall structures of trees to vascular networks. These branched structures have emerged as a result of an optimization between the maximization of a surface area and the minimization of transport losses. Elucidating these sophisticated designs proposed by nature is of paramount importance for the creation of higher-efficiency materials. The fabrication of such structures is however particularly challenging at small scale. In this paper, we focus on amorphous carbon microstructures, which provide a wide electrochemical stability window, excellent bio-compatibility, and cost-effective fabrication. However, relatively few methods have been developed for the fabrication of hierarchical amorphous carbon microstructures.Here we show that novel anisotropic microarchitectures comprising vertically aligned amorphous carbon nanowires CNWs can be made by oxygen plasma treatment of epoxy resins, followed by pyrolysis. Interestingly, these structures can also be shaped into deterministic three-dimensional (3D) hierarchical structures where nanowires are anchored to a microsized solid carbon core. These structures could play a key role in the development of new electrodes for microsensors, bioprobes, batteries, and fuel cells.

A. John Hart
University of Michigan

Date submitted: 23 Nov 2011 Electronic form version 1.4