Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Crystalline Metal Oxide Nanoparticle Films for Renewable Energy Technologies ANNE DILLON, SE-HEE LEE, ROHIT DESHPANDE, PHILIP PARILLA, KIM JONES, HARV MAHAN, NREL — Hot-wire chemical vapor deposition (HWCVD) has been employed as a scalable method for the deposition of crystalline tungsten oxide nanorods and nanoparticles. Under optimal synthesis conditions, only crystalline WO_3 nanostructures with a smallest dimension of $\sim$ 10 - 50 nm are observed with extensive transmission electron microscopy (TEM) analyses. X-ray diffraction (XRD), Raman spectroscopy and electron diffraction confirm that the crystalline phases of the nanostructures may be tuned by varying the synthesis conditions such that a single phase is obtained. HWCVD has also been employed to produce crystalline molybdenum oxide nanoparticles at high density. TEM analyses show that the smallest dimension of these nanostructures is $\sim$ 5 – 30 nm. XRD and Raman analyses reveal that the materials are highly crystalline and consist of Mo, MoO_2 and MoO_3 phases. It is also possible to fabricate large area porous films of either the tungsten or molybdenum oxide nanoparticles using a novel electrophoresis deposition technique. Furthermore, WO_3 nanoparticle films have led to profound advancement in state-of-the–art electrochromic technologies, and MoO_x films are promising for new lithium-ion batteries.

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Date submitted: 03 Dec 2006 Electronic form version 1.4