Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Advanced Synthesis of Spinnable MWCNT Forests by RF-Induction Heating Enhanced CVD Process ANVAR ZAKHIDOV, Professor, Physics DEpartment, University of Texas at Dallas, WILLIAM HOLMES, Solarno Inc., engineer, UTD SOLARNO TEAM, SOLARNO UTD TEAM — We demonstrate here an advanced method to effectively grow tall multi-wall carbon nanotubes (MWCNT) vertically oriented forests which are highly spinnable. Heating of the Fe catalyst is achieved extremely fast by RF induction heating using coils outside the quartz tube. This method and the new apparatus designed and presented in this paper allow separate control over the temperature of the substrate and the temperature of the incoming gases. In addition to temperature control, the fast T-ramping of the substrate preserves the catalyst nanoclusters from Ostwald ripening and other growth quenching effects such as carbon overgrowth of the catalyst. We show that the parametric sweet spot or bell curve of substrate spinnability can be increased significantly with this improved RF-CVD method. The catalyst nanoclusters also show a wide band of density arrangements that very positively effect spinnability and the drawing ratio. Drawing ratios can vary from 2 meters to 12 meters of sheets drawn from only 1cm of forest. RF-CVD method allows to grow fast (in several minuts) higher CNT forests at higher temperature of synthesis up to 800 K, and obtain dry-spinable CNTs, Characterization results of the samples created in the newRF-CVD system will be presented and compared to previous CNT sheet samples by conventional three-zone resistive heating CVD to measure the extent of property improvements of the CNT sheets and forests. Specifics of the experimental system will be addressed in detail and future property improvements and applications explored.

Anvar Zakhidov
Professor, Physics Department, University of Texas at Pallas

Date submitted: 14 Nov 2014 Electronic form version 1.4