Abstract Submitted
for the TSF17 Meeting of
The American Physical Society

Multigene Delivery and Gene-selective Imaging with Single-walled Carbon Nanotubes MD TANVIR HASAN, ELIZABETH SIZEMORE, Texas Christian University, LYNN KIRKPATRICK, Ensysce Inc, ANTON NAUMOV, Texas Christian University — Single Wall Carbon Nanotubes (SWCNT) have a great potential in biological applications since they possess quasi-one-dimensional structure ading internalization and exhibit fluorescence in near-IR with reduced biological autofluorescence background. In this work, we use SWCNTs for *in-vitro* multi-drug delivery and imaging: each gene or drug is non-covalently bound to SWCNTs of a specific chirality and can be tracked and assessed separately. Single chirality SWCNTs are separated by a modified Aqueous Two-Phase Extraction (ATPE) method with a purity of up to 40% with only (1-5) % contributions from other chiralities. This allows observing microscopically the fluorescence mainly from the target chirality. Separation surfactants are removed by repeated centrifugal washing/ ablation procedure and replaced by siRNA. Finally, chirality-sorted SWCNTs are applied as multidrug delivery vehicles carrying non-covalently complexed siRNA gene therapeutics into liver cancer cells. Internalization of SWCNTs of each specific chirality is observed via near-IR hyperspectral fluorescence microscopy allowing to record wavelength-resolved images within emission bands of each individual chirality, and therefore assess each gene's delivery separately. The results of this work indicate that SWCNT can serve as efficient multidrug/gene delivery carriers for imaging and therapeutics mapping out internalization pathways and effects of each drug/gene separately.

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Date submitted: 21 Sep 2017 Electronic form version 1.4