American-German Partnership to Advance Biomedical and Energy Applications of Nanocarbon

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Global Conversations
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RESEARCH THRUSTS

- **Cell Nanosurgery** – repair, modification, metrology

- **Nano-Bio Metrology** – sensing, therapeutics, platforms

- **Nanofluidics** – behavior, transport, interfaces

- **Nanomanufacturing** – nanomaterials, nanostructured devices

FACILITIES

- 1,000 sqft. wet chemistry / characterization laboratory
- Fluorescence microscopes, SEM, nanomanipulators/injectors
- Capillary pulling, high temp tube furnace, chemical etching
- Nanofluidic characterization setup

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Presser Group
Explore. Create. Apply.

- Carbon nanomaterials
- Advanced ceramics
- Electrochemical energy storage
- Capacitive deionization
- Gas storage
- Electrospinning
Goal

Solve current challenges in energy and biomedicine through international partnership.

Approach

Investigate fluid transport in carbon nanotubes for biomedical and energy applications.

Project Aims

• Synthesize carbon nanotubes using template-based approaches
• Characterize the structure and morphology of these nanotubes
• Measure fluid flow through the nanotubes
RESULTS

AAO Membrane → Deposit Carbon by CVD → Etch Away Template → Pores → CNTs

500 nm
RESULTS

Conducted Parametric Study of CNT Synthesis Conditions (@ RIT):

- Reaction Time
- Temperature
- Gas Flow

Plotted Wall Thickness and Mass Deposited vs. Parameter

TEM and SEM Micrographs of the Samples Synthesized at Various Temperatures

Conducted Raman Spectroscopy of CNTs (@ INM):

- No changes in morphology

Normalized Raman Intensity

Raman shift (1/cm)

D peak
G peak
Just high background
Overtones
**Project Outcomes**

- CNT wall thickness: increases proportionally with time and temperature; increases proportionally with flow rate but peaks and then decreases.
- CNT morphology does not change in the range of parameters tested.
- 1 manuscript in preparation for peer-reviewed journal
- Partially supported 1 RIT PhD student

**Future Work**

- Measure flow through CNTs
- Explore new carbon-based nanostructures
- Identify and apply for external funding supporting international collaborations.
- Establish a “research abroad” mechanism between RIT and INM for graduate and undergraduate students.