Insights into Energy Absorption Mechanisms in Hierarchical Carbon Nanotube Forests

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Introduction

VACNTs (vertically aligned carbon nanotubes) –
- unique hierarchical structure resulting in
- mechanical properties that combine the best of polymeric (high recoverability) and metallic foams (higher strengths even at large ~60-80% strains).

- What governs the energy absorption mechanism in VACNTs and their amazing recovery?
- How do these properties change under different loading and boundary conditions in VACNTs

VACNT growth
- Photolithography - Photosist application - UV Exposure VACNT pillars - developing
- E-beam evaporation - catalyst Ti (30nm)/Al (10 nm)/Fe (3 nm)
- Photosist removal
- CVD CNT growth - Pressure: 750 mbar - Temp: 750 C - Carbon source gas: Acetylene
- Multwall CNT, dia 8.8±2nm, density ~80mg/cm2

Flat punch Indentations on VACNT film

Hierarchical morphology of VACNTs:
- continuous film 260X magnification
dominantly vertical alignment of CNTs at 30,000X
- intertwined network at 240,000X
- individual multiewalled CNTs (TEM)

References


Acknowledgments

- Supported by the Institute for Collaborative Biotechnologies through contract W911NF-09-D-0001 from the U.S. Army Research Office.
- SP gratefully acknowledges support from the W.M. Keck Institute for Space Studies Postdoctoral Fellowship program for this work.