

# Development Of Carbon NanoFoam And Metal Carbon Composite Materials With Novel Morphologies For Fusion And Spin-off Applications.

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# Carbon Foams in High gain design of ICF Target

- *Direct Drive Schemes of ICF are showing promise over Hohraum based Indirect Drive Schemes.*
- *With better Target Designs Rayleigh-Taylor Instabilities are controlled*
- *NRL have now developed a target design with a predicted energy gain of 125 using a 1.3 MJ KrF laser.*
- *Carbon nano foam overcoat layer plays a significant role in these designs*
- *Metal loaded foams and carbon foams with thin layer of metal create green house targets driven by direct irradiation.*

*Direct Drive Targets Designed by NRL team show good performance in Simulations attributed to a) carbon foam overcoats with DT loading, b) careful shock tailoring, c) effective preheating etc*

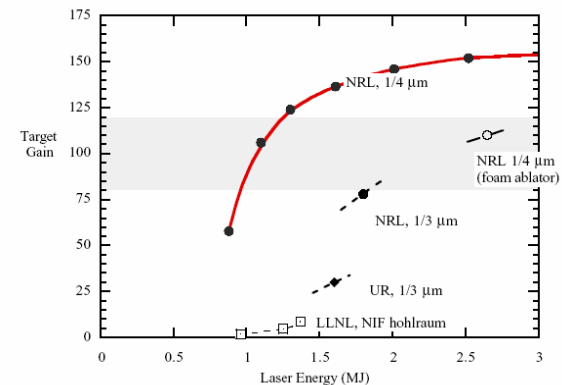


Fig. 1 Target gain versus laser energy for various target designs. The hatched region indicates the minimum gain required for a power plant.



# Carbon Foam Development for Fusion Target Applications

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- Development of mesoporous carbon foam monoliths with uniform pore size distribution using R-F Chemistry and Super Critical Drying Schemes.
- Development of Low density materials  $< 100\text{mg}/\text{cm}^3$
- Development of Deuterated Carbon foam materials with  $> 10\%$   $\text{D}_2$  loading

# MAJOR DEVELOPMENTAL GOALS



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## *Fusion Targets:*

- *Glass Micro Balloons*
- *Carbon Foams, Monoliths, Films*
- *Carbon Foams Micro Spheres for wicking cryo D<sub>2</sub> fuels*

## *Spin Off Technologies*

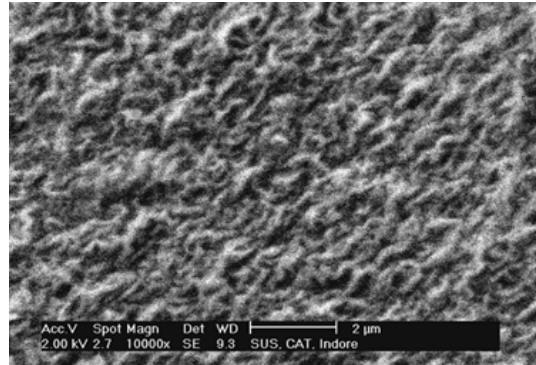
### *Carbon Foam (Aerogel) for*

- *Desalination Of Water by CDI technique*
- *Pt. Loaded Catalyst for H<sub>2</sub>/D<sub>2</sub> Exchange by Liquid Phase Catalytic Exchange Technique*

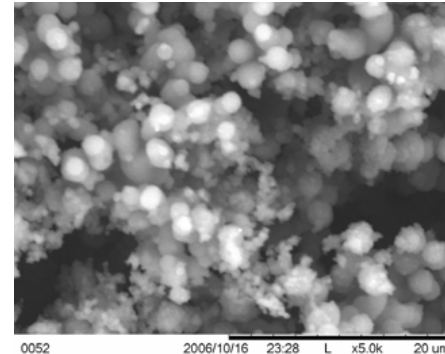
# Carbon Foams in various Morphologies



**Transparent Resorcinol  
Formaldehyde Gel**



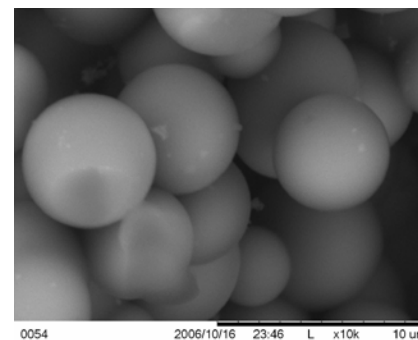
**SEM image of carbon foam  
for Fusion, sample made by  
Critical Point Drying route**



**SEM of carbon foam for  
Desalination and Catalyst  
applications Open Air drying  
5000 X Above, 10000 X Below**



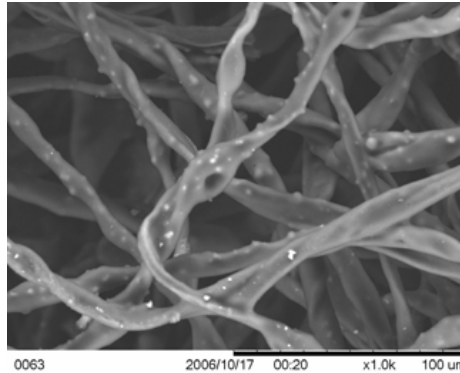
**Thin Large Electrodes  
For Desalination  
Application**



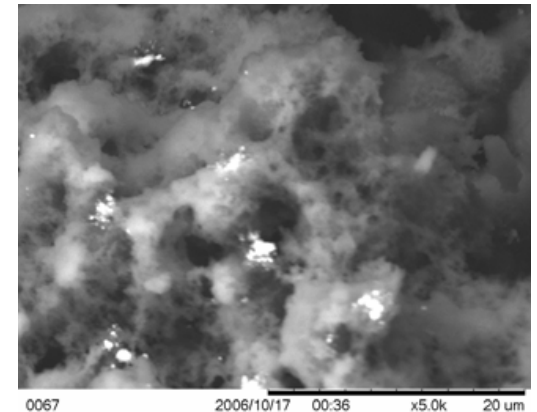
# Carbon Foam with Platinum Loading as Catalyst



**Platinum loaded  
carbon foam**



**SEM of Scaffolded  
Carbon with Pt**



**SEM of Raw Carbon  
foam with Pt loading  
0.5 % w/w**

# Borisenko N.G.

