

IUPAP Commission 10

**Structure and Dynamics of
Condensed Matter**

Working Group on Nanoscience

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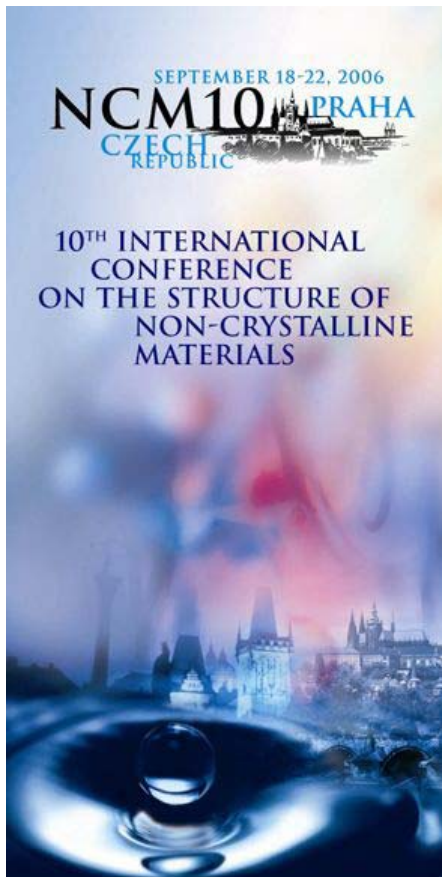
September, 2006

Commission Conferences

8th International Conference on Materials and
Mechanisms of Superconductivity and High
Temperature Superconductors

July 9-14, 2006

Dresden, GERMANY



10th International Conference on the Structure of
Non-Crystalline Materials

September 18-22, 2006

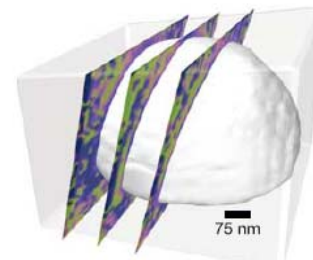
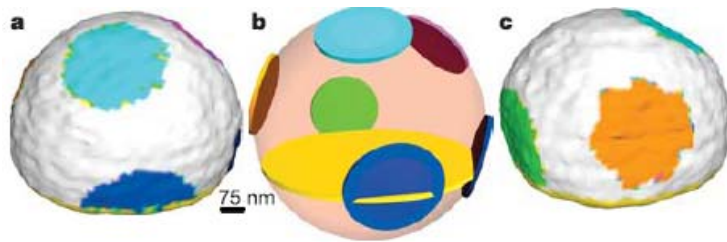
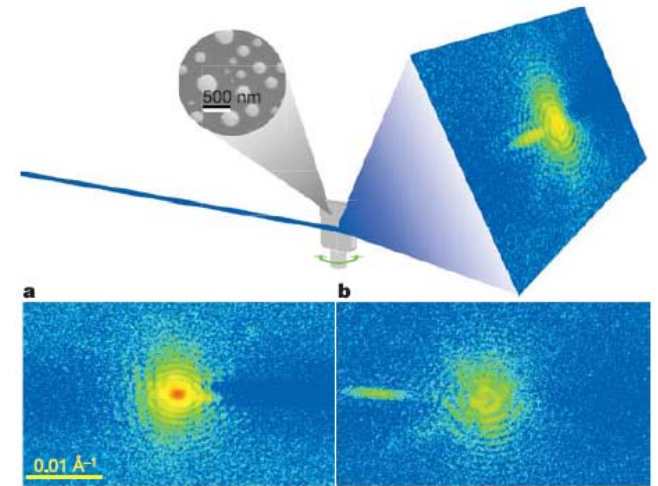
Prague, CZECH REPUBLIC

Coherent X-ray diffraction imaging

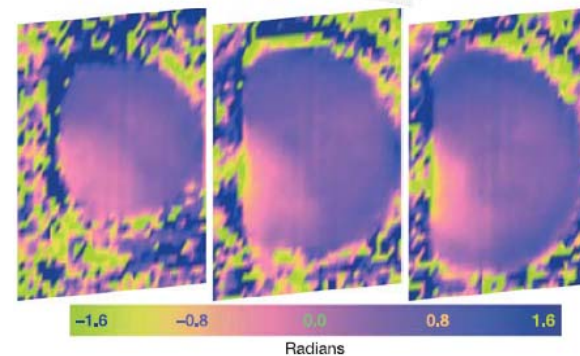
Lead nanocrystals on silicon

Coherent diffraction on a single particle

Reconstruction of particle shape



Imaging of strain fields



M.A. Pfeifer, G.J. Williams, I.A. Vartanyants, R. Harder & I.K. Robinson
Nature **442**, 63–66 (2006)

Nanotube foams

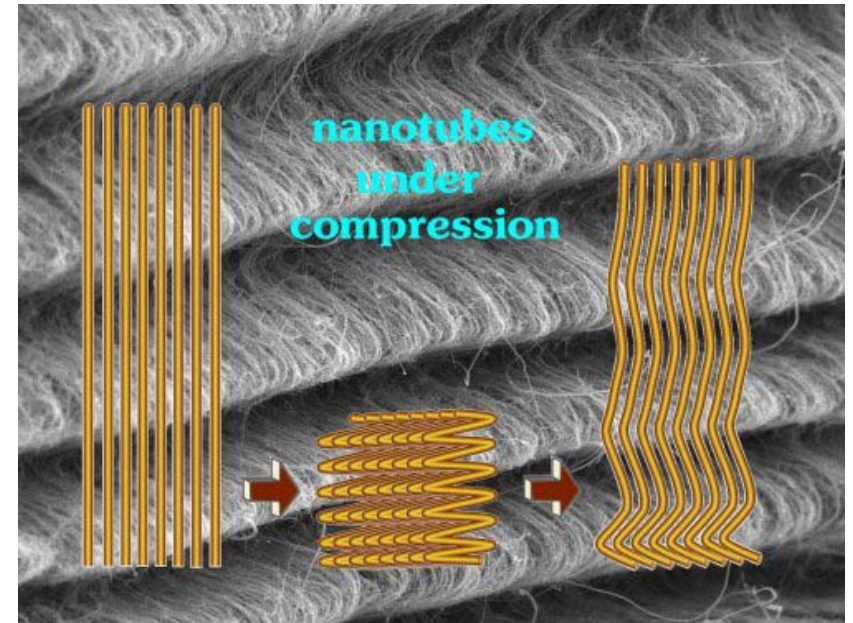
Chemical vapour deposited nanotube foam

Strong and flexible

Large porosity: $\sim 87\%$

Large compressive strength: $\sim 15\text{MPa}$

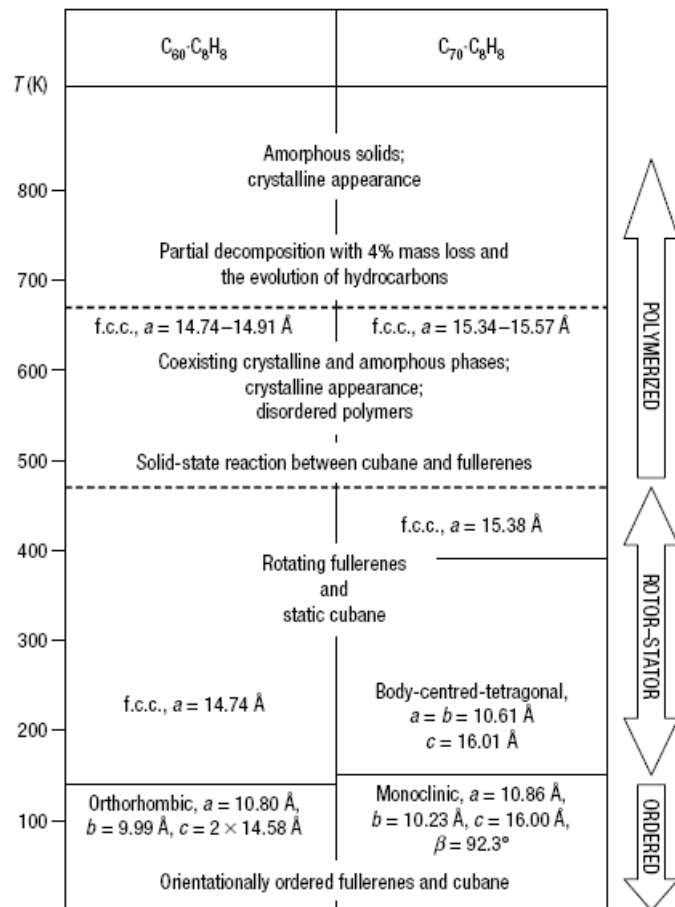
The nanotubes buckle collectively



A. Cao, P.L. Dickrell, W.G. Sawyer, M.N. Ghasemi-Nejhad, P.M. Ajayan
Science **310**, 1307 (2005)

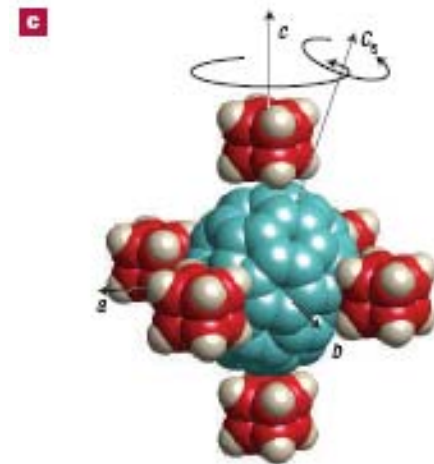
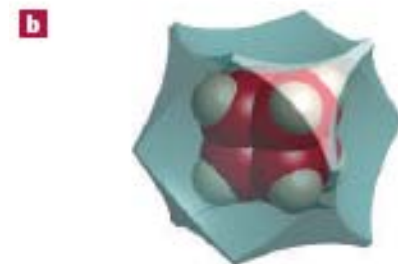
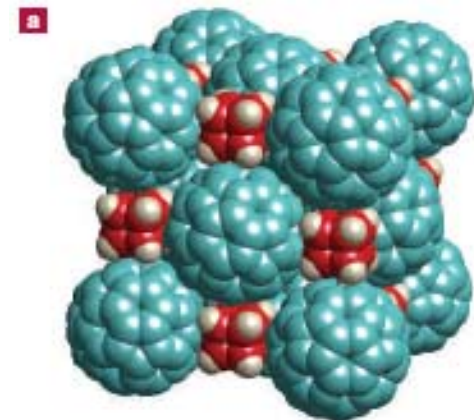
Rotor–stator molecular crystals

Cubane (C_8H_8) - fullerene (C_{60} or C_{70}) molecular crystal



The cubane fits into the octahedral void of the f.c.c. cell

The fullerene rotates in the molecular bearing of six cubanes



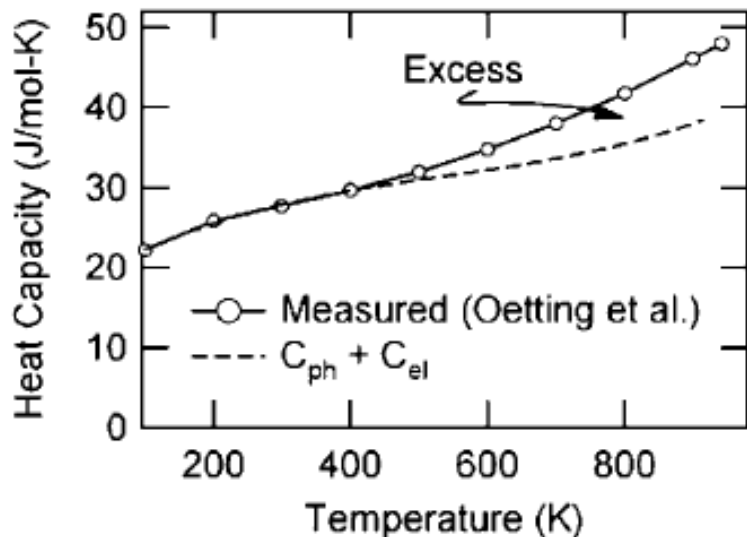
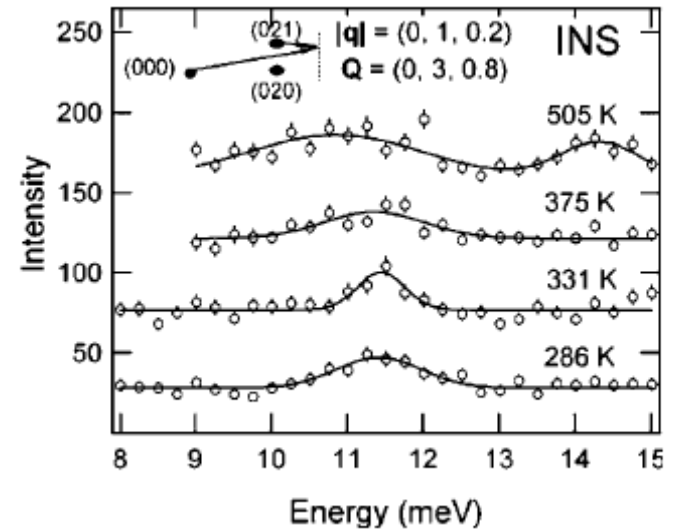
S. Pekker *et al.*
Nature Materials **4**, 764 (2005)

Solitons in uranium

Inelastic x-ray and neutron scattering on α -uranium

Intrinsically localized mode appears above 450K

- not coupled to structural change
- strongly nonlinear
- form randomly in the lattice \rightarrow additional configurational entropy



M. E. Manley, M. Yethiraj, H. Sinn, H. M. Volz, A. Alatas, J. C. Lashley, W. L. Hults, G. H. Lander, and J. L. Smith

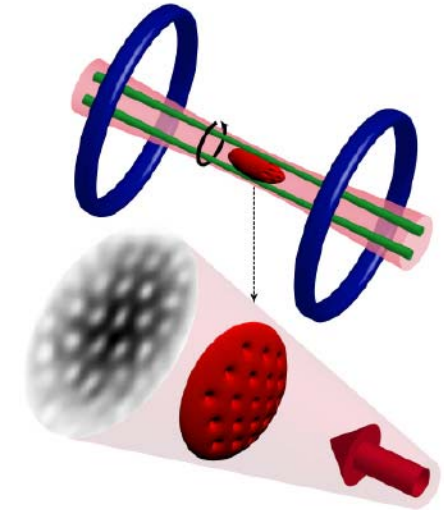
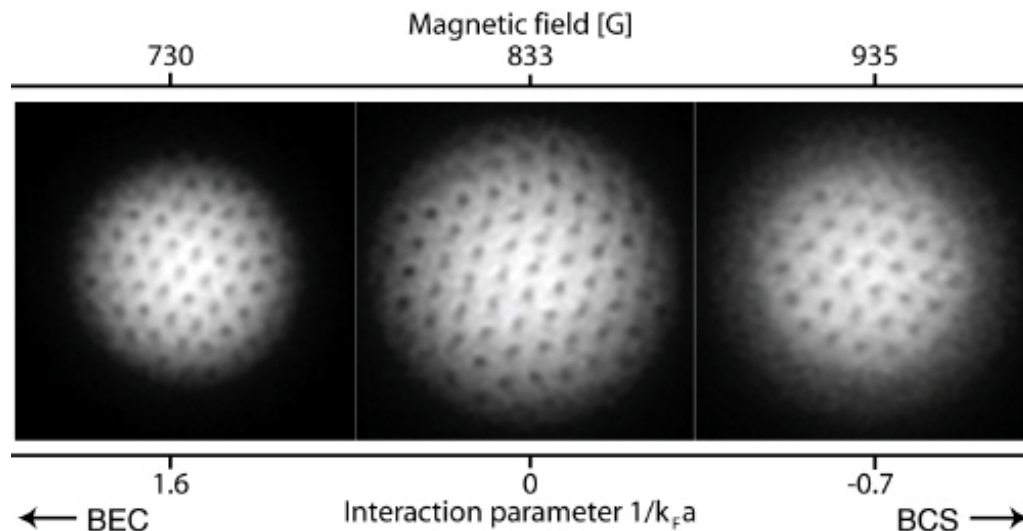
Phys. Rev. Lett. **96**, 125501 (2006)

Vortices and superfluidity in a Fermi gas

^6Li atoms cooled to 50nK in a magnetic trap

Control the strength of the interaction by the magnetic field

Crossover between BEC and BCS state



M. W. Zwierlein, J. R. Abo-Shaeer, A. Schirotzek, C. H. Schunck & W. Ketterle
Nature **435** 1047 (2005)