

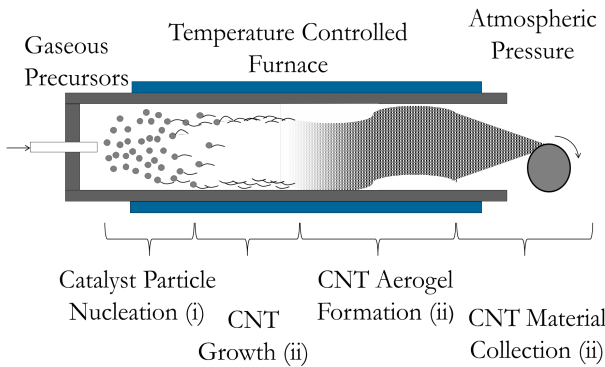
*graduated from Ecole Polytechnique (Paris) and the University of Cambridge (Part III, theoretical physics), carried out master thesis at Harvard in the Capasso group (photonics), starting a Ph.D in statistical physics at Université Pierre et Marie Curie in September

Aerogel formation of Carbon Nanotubes (CNTs)

Maxence Ernout*

Supervised by Christian Hoecker and Dr. Adam Boies, with the help of Dr. Lee Weller

Motivation



Question :

Why and how does this aerogel of carbon nanotubes form ?

Why do we ask this question ?

Engineer the production of carbon nanotubes for their mechanical, electronic and thermal properties

Theory of a single CNT

$$m \frac{d\mathbf{v}}{dt} = -f_{tr}\mathbf{v} + \mathbf{X}_{tr}(t)$$

$$\langle \mathbf{X}_{tr}(t) \rangle = 0$$

$$\langle \mathbf{X}_{tr}(t) \mathbf{X}_{tr}(t') \rangle = 6f_{tr}kT\delta(t-t')$$

translation



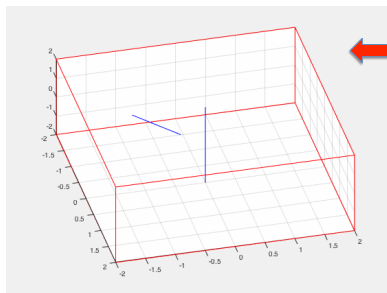
$$I \frac{d\mathbf{\Omega}}{dt} = -f_{rot}\mathbf{\Omega} + \mathbf{X}_{rot}(t)$$

$$\langle \mathbf{X}_{rot}(t) \rangle = 0$$

$$\langle \mathbf{X}_{rot}(t) \mathbf{X}_{rot}(t') \rangle = 6f_{rot}kT\delta(t-t')$$

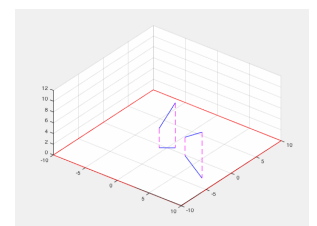
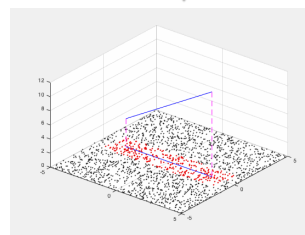
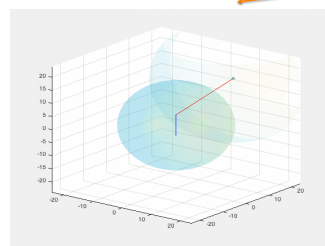
rotation

Algorithms to characterize the geometrical and physical collision



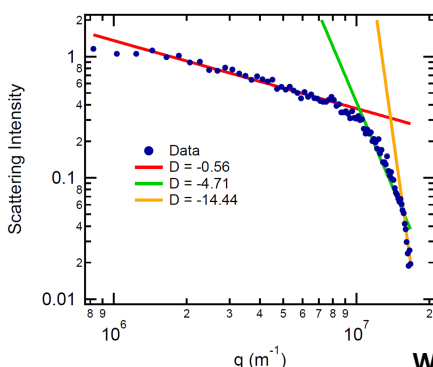
Physical input :
diffusive Knudsen number

$$K_{nD} = \frac{\sqrt{kTm_{ij}\pi R_{S,ij}}}{f_{ij}PA_{ij}}$$



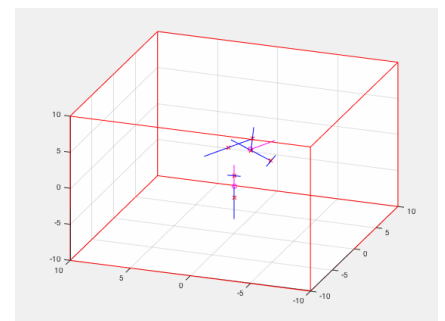
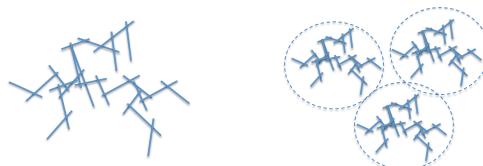
Four different algorithms to compute the physical quantities at stake

Cluster-cluster aggregation : scattering experiments and theory



Question :

Is the CNT gel a simple **aggregate** or a **superaggregate** ?



Work to be presented at the 22nd European Conference of Aerogels in Tours in September