A stress vs. strain graph of undeformed spherulite structures, deforming spherulite structures and microfibrillar structures.

From Samuels, R.J. *Structured Polymer Properties.* New York: Wiley-Interscience, 1974.

Orientation

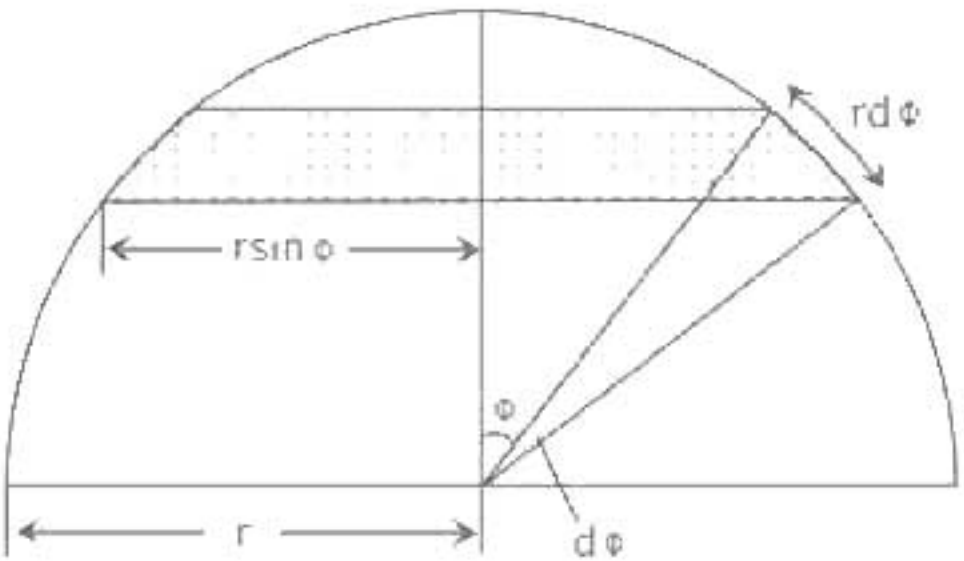
Hermans function:

$$f = \frac{3\langle \cos^2 \varphi \rangle - 1}{2}$$

Axial: $f = \frac{3(1)-1}{2} = 1$

Transverse: $f = \frac{3(0)-1}{2} = -\frac{1}{2}$

Isotropic:



fraction in dφ:

$$F(\varphi)\, d\varphi = \frac{(2\pi \cdot r\sin\varphi)(r\, d\varphi)}{2\pi r^2}$$

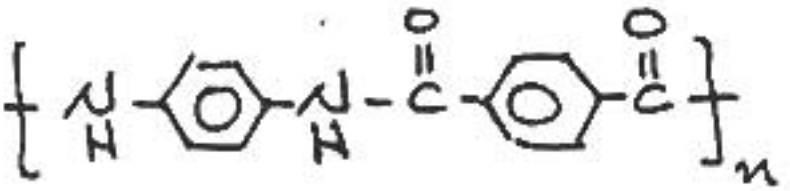
$$\langle \cos^2 \varphi \rangle = \int_0^{\pi/2} \cos^2 \varphi \cdot F(\varphi)\, d\varphi = \frac{1}{3}$$

$$f = \frac{3(1/3)-1}{2} = 0$$

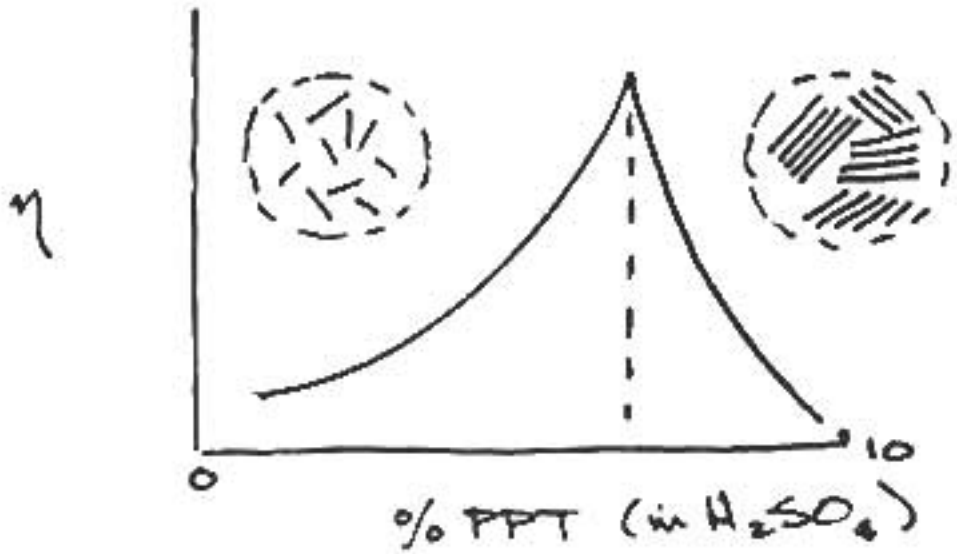
High Modulus Fibers

- Liquid crystal polymers (LCP)

  eg Kevlar (p-phenylene terephthalamide)



Nematic liquid crystals



- Ultradrawing eg Spectra