

## 020307 XRD Quiz 8

**NOTE: SEMINAR 3PM FRIDAY ON XRD SEE POSTING BY OFFICE.**

- 1) Derive the Hoffman-Lauritzen equation for crystal thickness by:
  - First give the relationship between  $t$  (thickness) and  $T_c$  the temperature of crystallization.
  - Obtain an expression for  $S$  in terms of  $T$  and  $H$
  - Obtain an expression for  $f$  for the crystal at equilibrium at  $T_c$
  - Solve for  $t$  in terms of  $f$ ,  $H$ ,  $T_c$ , and  $T$ .
  
- 2) Derive the power law scattering rule for rods between the diameter and length by:
  - Write a general expression for  $I(q)$  using  $n_e$  and  $N$
  - Write expressions for  $N$  and  $n_e$  for a rod of fixed diameter between the diameter,  $D$ , and the length,  $r$ , of the rod as a function of  $r$ .
  - Use these two expressions in the expression for  $I(q)$
  - Use the Fourier equivalence  $r \Rightarrow 1/q$  to write a general power-law expression in these limits ( $I(q) = B_1 q^{-df}$ )
  - What is the dimension (mass-fractal dimension,  $d_f$ ) for a rod?
  
- 3) Explain the procedure of determining the DOC for a polymer starting with the XRD scans. This is the same procedure you used in lab to determine DOC. Number the steps you go through.

**ANSWERS: 020307 XRD Quiz 8**

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- 1) See Web notes on Polymer XRD.
- 2) See Web notes on SAXS
- 3) See Web notes on Polymer XRD and the Lab write-up.