Oct. 1/18

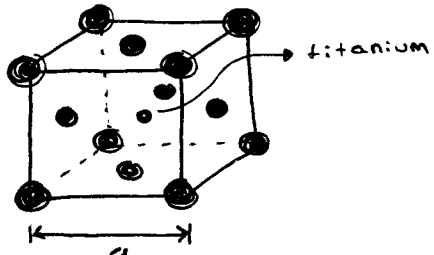
Midterm : 2, 3, 12, 14 (Possibly a small amount of Ch. 4)

Ceramic crystals : Barium titanate

CN for titanium (look at anions) : 6

CN for oxygen (look at cations) : 6

CN for barium : 12

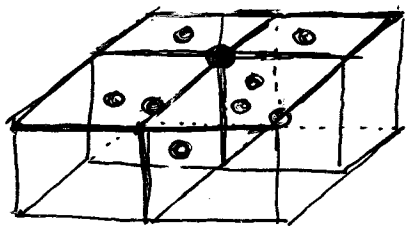


then $a = 2(r_{Ti^{4+}} + r_{O^{2-}})$

n' { Ti^{4+} : 1; Ba : $(\frac{1}{8} \times 8) = 1$; O : $(\frac{1}{2} \times 6) = 3$

then $n' = 1$

adding four more unit cells shows CN = 12



● - barium

● - oxygen

→ Ca : 4
F : 8

→ n' is how many molecules you can make.

→ Zn = 4
S = 4
$n' = 4$

→ NaCl : $A_{Na} + A_{Cl}$
CaF_2 : $A_{Ca} + 2A_F$
$BaTiO_3$: $A_{Ba} + A_{Ti} + 3A_O$

$\rho = \frac{nA}{V_c N_A}$

volume of unit cell = a^3

Example 12.3

$a = 2(r_{Na^+} + r_{Cl^-})$

Cl^- : $(6 \times \frac{1}{2}) + (\frac{1}{8} \times 8) = 4$

Na^+ : $(\frac{1}{4} \times 12) + 1 = 4$

$n' = 4$ (NaCl)

$\rho = \frac{n'(\Sigma A_C + \Sigma A_A)}{V_c N_A} \Rightarrow \frac{n'(A_{Na} + A_{Cl})}{[2(r_{Na^+} + r_{Cl^-})]^3 N_A}$

$V_c = a^3$

$a = 2(r_{Na^+} + r_{Cl^-})$

$n' = 4$

$A_{Na} = 22.99$ g/mol

$A_{Cl} = 35.45$ g/mol

$r_{Na^+} = 0.102\text{nm} = 0.102 \times 10^{-7}$ cm

$r_{Cl^-} = 0.181\text{nm} = 0.181 \times 10^{-7}$ cm

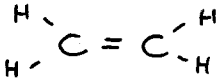
$\Rightarrow \rho = \frac{4(\text{Formula units}) \times (22.99 + 35.45 \text{ g/mol})}{2[0.102 \times 10^{-7} + 0.181 \times 10^{-7}] \times 6.022 \times 10^{23}}$

$\rho = 2.14$ g/cm³

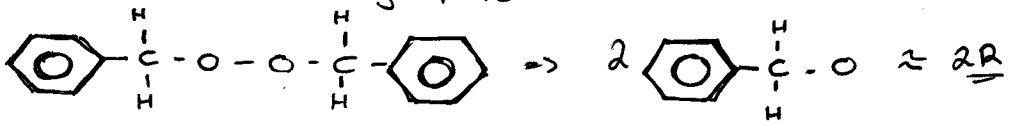
Where actual density of NaCl is 2.16 g/cm³

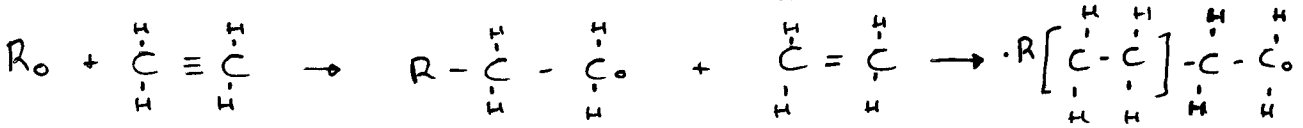
Lecture 5 – Chapter 14

Addition mechanics



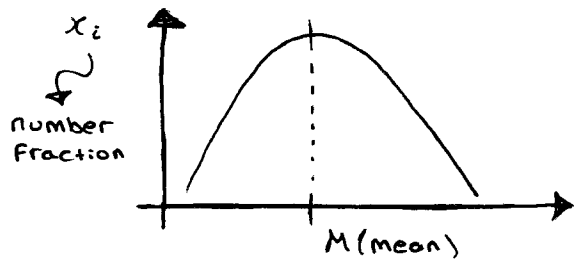
initiator : Benzoyl Peroxide





10,000 g/mol → 1,000,000 g/mol

M range (g/mol)	M (mean)	Number	x_i
0 - 20	10	2	2/10 = 0.2
20 - 40	30	3	0.3
40 - 60	50	4	0.4
60 - 80	70	1	0.1

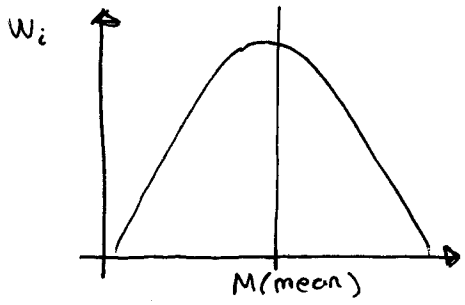


$\overline{M_n} = \sum x_i M_i$

$DP = \overline{M_n}/m$ → 20 molecular weight of repeating unit

↳ degree of Polymerization

M range	Mean	Weight of Chains	w_i → weight fraction
(	(	50	0.125
		105	0.2625
		180	0.45
		65	0.1625
(same)	(same)		



$\overline{M}_w = \sum W_i M_i$

W_i → weight fraction

$\overline{M}_w$ → weight, average molecular weight

$\overline{M}_n = \sum Y_i M_i$ $\quad DP = \frac{M_n}{m}$

$\overline{M}_n$ → number average molecular weight