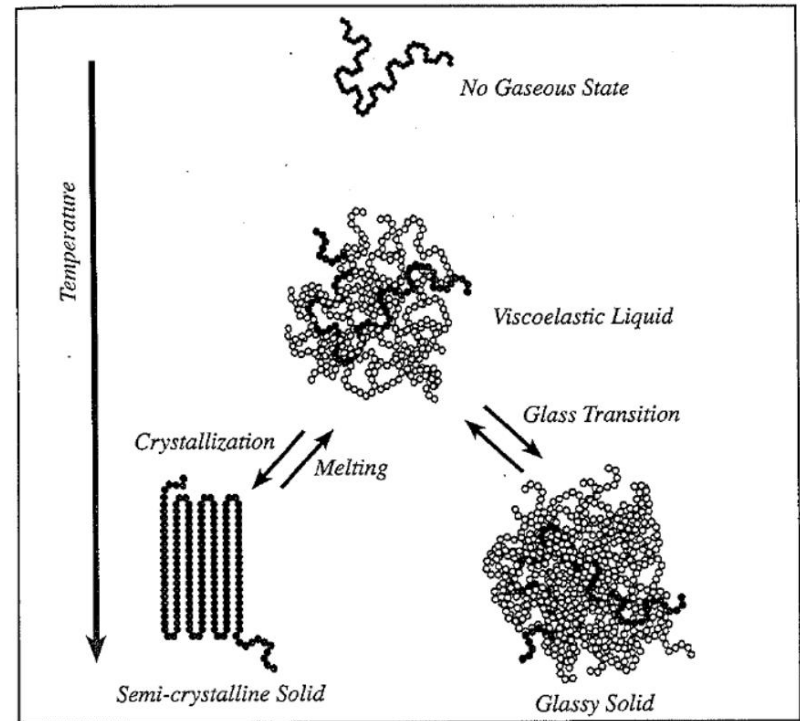
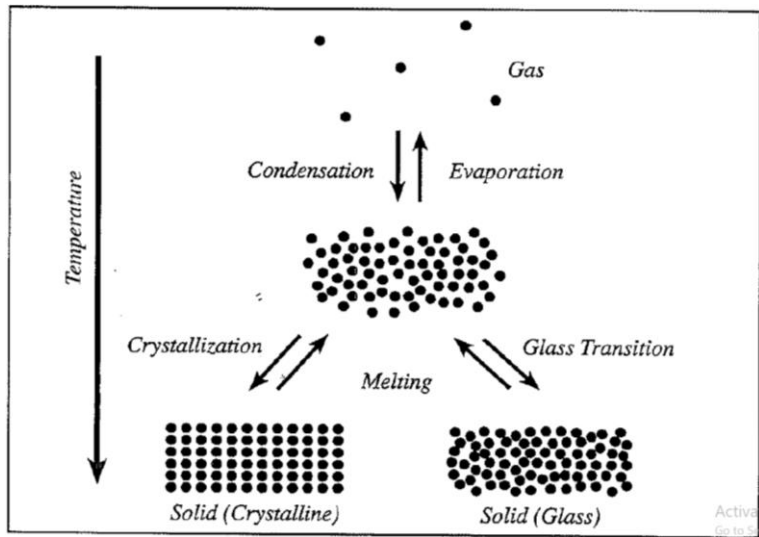
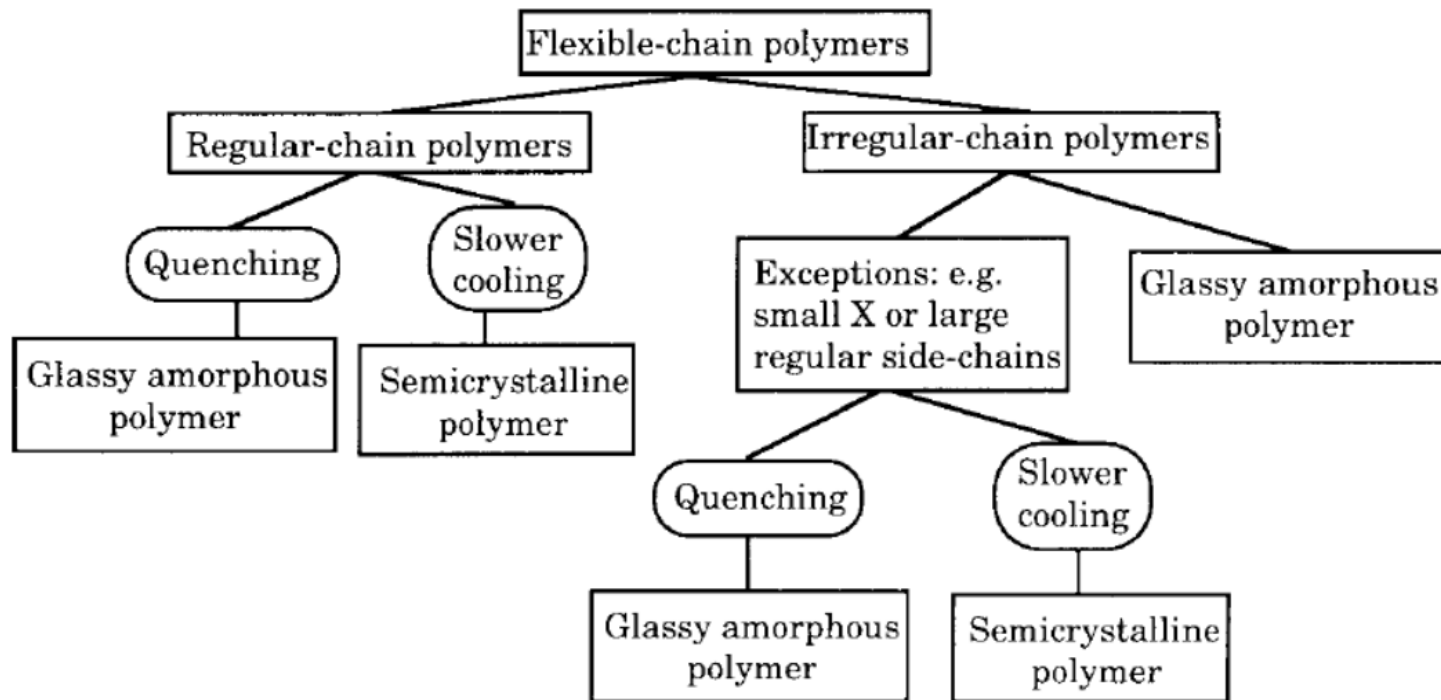


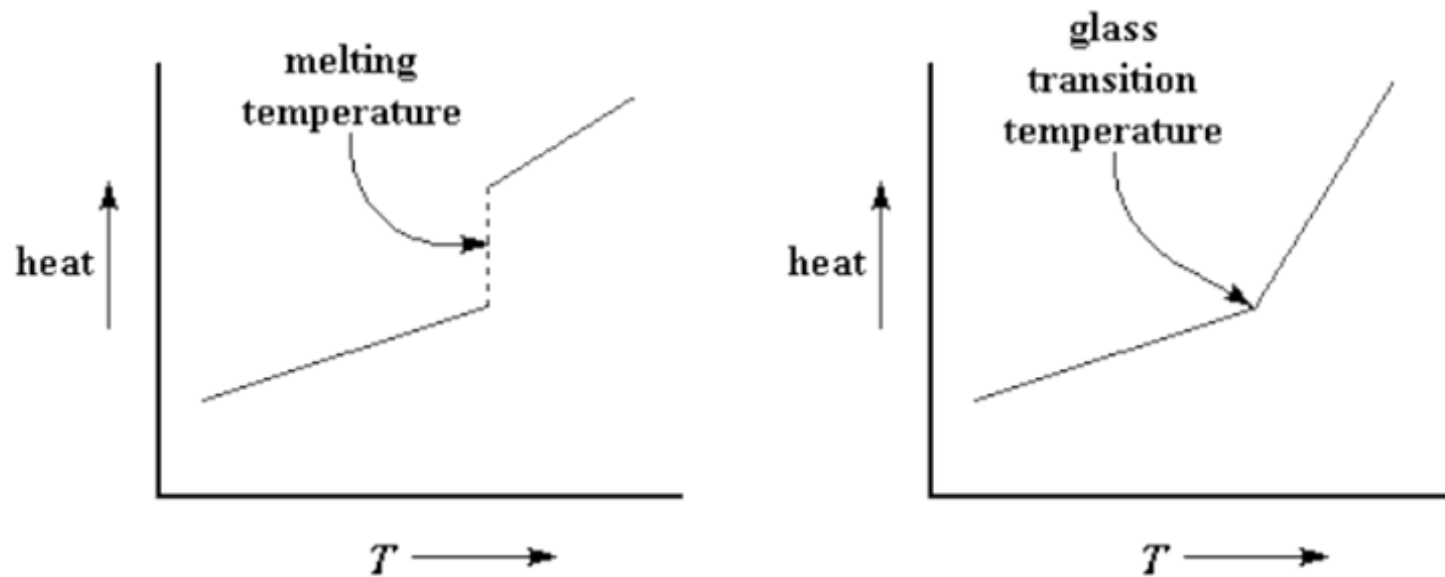
TXL211

Lecture 6

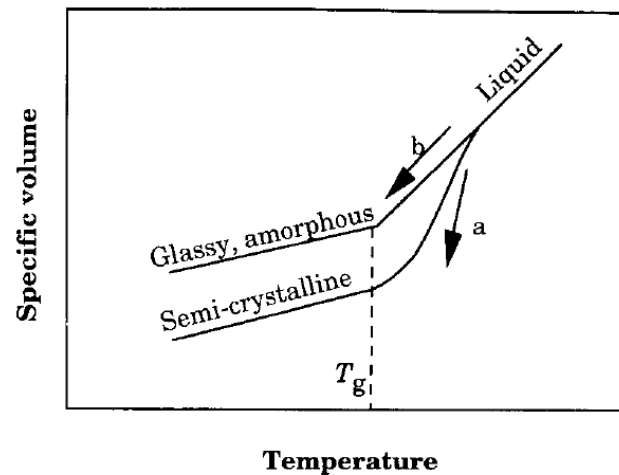




The effect of molecular and thermal factors on the structure of the solidified polymer.

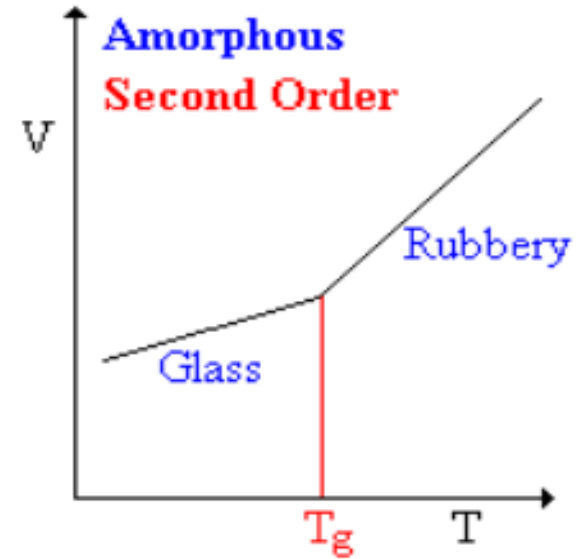
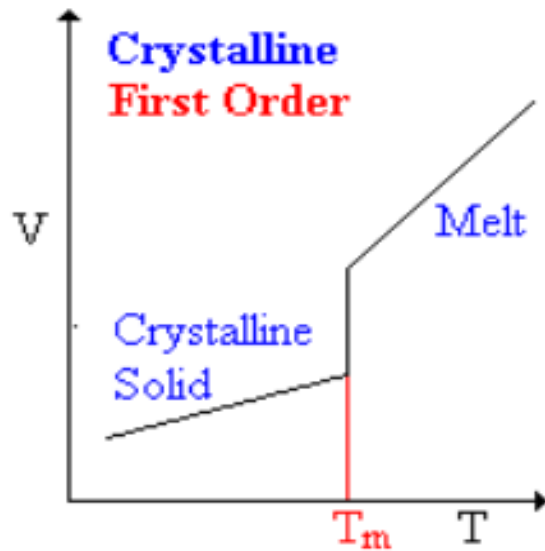


A heat vs. temperature plot for a crystalline polymer, on the left; and an amorphous polymer on the right.



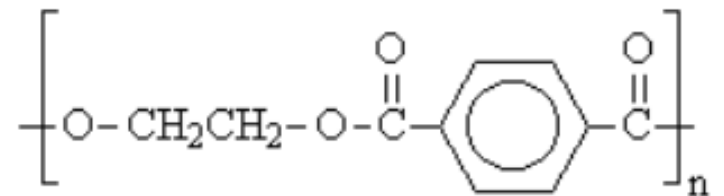
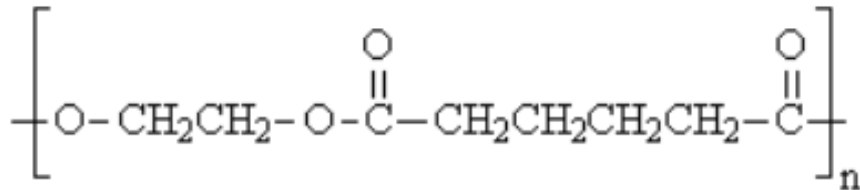
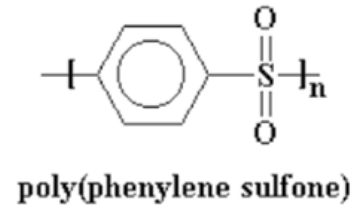
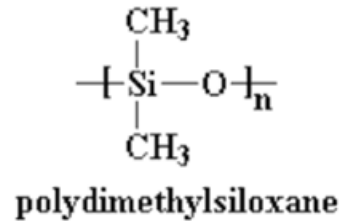
Cooling of a liquid following routes a (crystallization) or b (forming a glassy amorphous structure).

## First and Second order thermal transitions



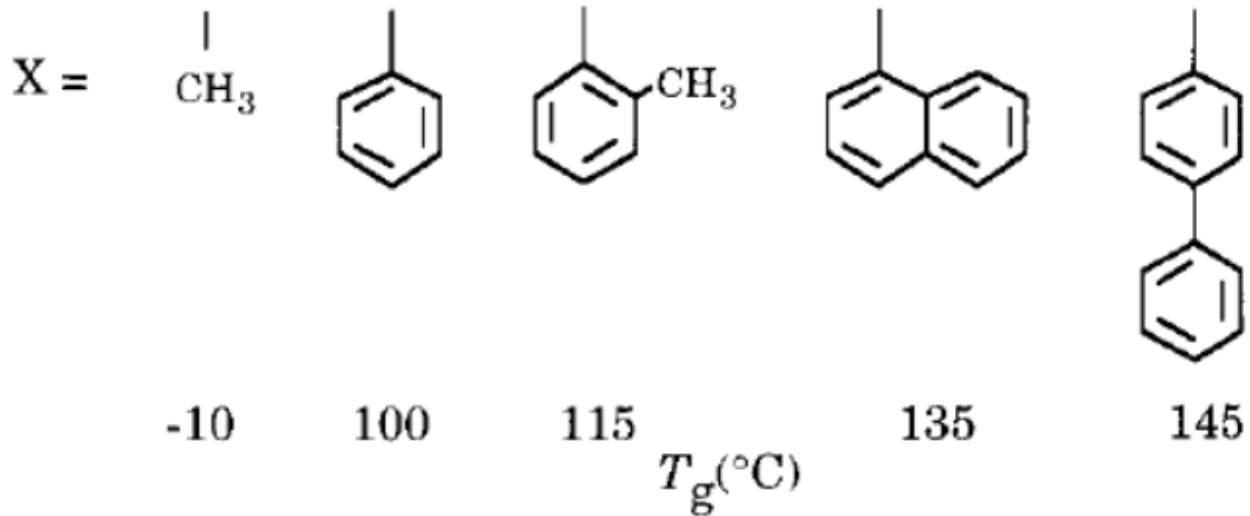
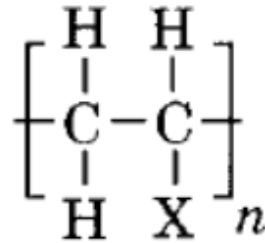
## Factors affecting Tg

## Backbone stiffness or flexibility



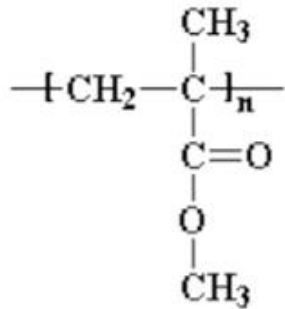
# Factors affecting T<sub>g</sub>

## Pendant Group – Case I



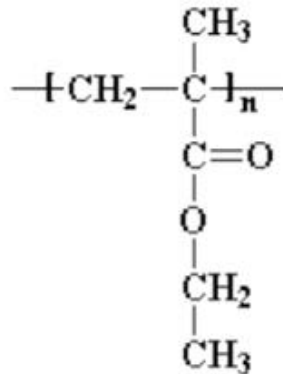
# Factors affecting T<sub>g</sub>

## Pendant Group – Case II



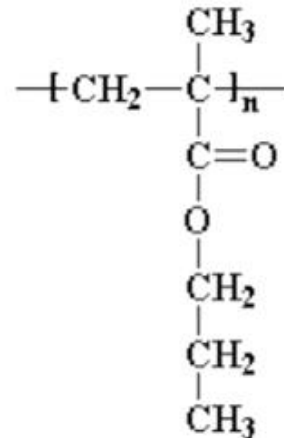
Poly(methyl methacrylate)

$T_g = 100\text{--}120\text{ }^\circ\text{C}$



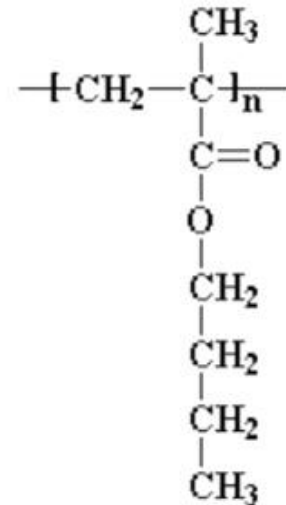
Poly(ethyl methacrylate)

$T_g = 65\text{ }^\circ\text{C}$



Poly(propyl methacrylate)

$T_g = 35\text{ }^\circ\text{C}$



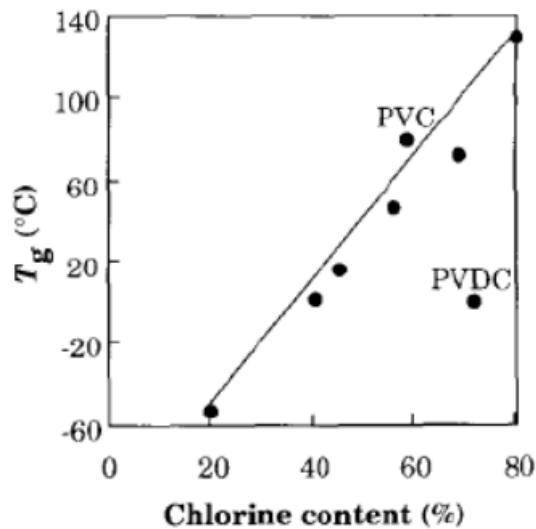
Poly(butyl methacrylate)

$T_g = 20\text{ }^\circ\text{C}$

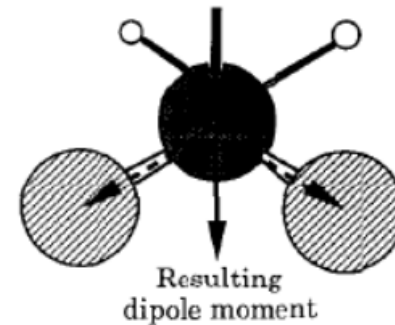


# Factors affecting T<sub>g</sub>

## Effect of structure – chlorine content



**Figure 5.5** Effect of chlorine content on the glass transition temperature of chlorinated polyethylene. Data for polyvinylchloride (PVC) and polyvinylidene chloride (PVDC) are shown for comparison. Drawn after data from Schmieder and Wolf (1953).



**Figure 5.6** Repeating unit of polyvinylidene chloride and schematic representation of the resulting dipole moment.

# Factors affecting T<sub>g</sub>

## Copolymerization

$$\frac{1}{T_g} = \frac{w_1}{T_{g1}} + \frac{w_2}{T_{g2}}$$

# Factors affecting Tg

**Plasticizer**