

Polydispersity index :

The various average molecular weights will have the same value if the polymer is perfectly monodisperse i.e. if all the molecules are of the same molecular weight. Otherwise, the averages increase in the following order - $\bar{M}_n < \bar{M}_v < \bar{M}_w < \bar{M}_z < \bar{M}_{z+1}$.

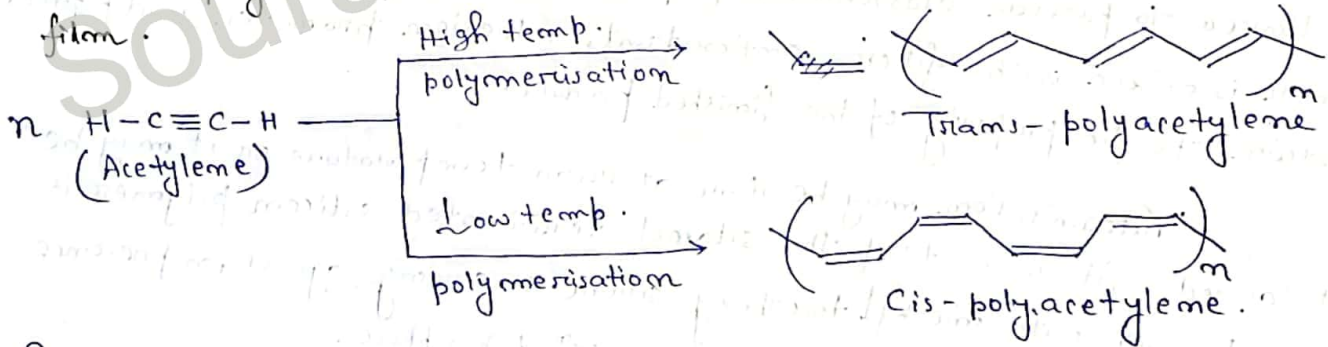
A measure of the degree of dispersity in molecular weight is usually obtained from the ratio of weight average to number average molecular weights. This ratio is called the polydispersity index (PDI).

$$PDI = \frac{\bar{M}_w}{\bar{M}_n}$$

Polyacetylene :- (Conducting polymer)

Preparation :- Polyacetylene is prepared by the polymerisation reaction of acetylene or other monomers. One of the most common methods uses a Ziegler-Natta catalyst, such as $Ti(OiPr)_4 / Al(C_2H_5)_3$, with gaseous acetylene. This method allows control over the structure & properties of the final polymer by varying temperature & catalyst loading.

Polymerisation at elevated temp. gave the trans polymer as red powder, whereas at low temp. the cis polymer was obtained as black powder. Polymerisation at $150^\circ C$ gives the silvery trans polymer film, whereas polymerisation at low temp. gives the copper coloured cis polymer film.



Use: - i) Doped polyacetylene offers a particularly high electrical conductivity therefore used as electric wiring or electrode material in light weight rechargeable batteries.

ii) Tri-iodide oxidized polyacetylene can be used as sensor to measure glucose concentration.

Polyaniline : (Conducting polymer)

Preparation :- Methods for the polymerisation of aniline to form polyaniline includes chemical oxidative polymerisation, interfacial synthesis, rapid mixing etc, nanofiber seeding, electrosynthesis etc.

In ~~oxide~~ chemical oxidative polymerisation of aniline is mixed with an oxidant in an acidic solution. The diameter of the polyaniline nanofibers can be controlled with this method through choice of acid. HCl produces nanofibers with a diameter of about 30 nm, while camphor-sulfonic acid & perchloric acid produce a diameter of 50 nm & 120 nm respectively. Most common oxidant i.e. ammonium peroxydisulfate is used for this method.

- Use :-
- i) Polyamide nanofibers can be used to create nonvolatile plastic digital memory devices when decorated with various metal like gold, gold nanoparticles etc.
 - ii) They can be used as chemical sensors. like H_2 gas, NO_2 gas, H_2S gas, volatile S-compounds, humidity etc.
 - iii) It is used as electromagnetic shielding, flexible electrodes, electrically conducting yarns (sensors), supercapacitors, etc. corrosion inhibitor, smart windows (electrochromism). ***