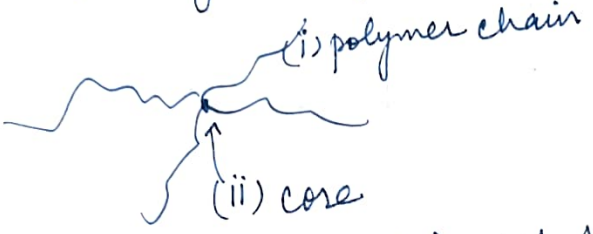
SPECIALITY POLYMERS

Speciality polymers are the polymers that are either themselves characterised by special properties or are modified for special uses. Some examples are :-

① DENDRIMERS

Star Polymers – They contain three or more polymer chains (i) originating from a core structural unit (ii)



Dendrimers – Dendrimers resemble the star polymer except that each leg of star exhibits repetitive branching in the manner of a tree. They are also known as dendritic, starburst or cascade polymers.

their inter ntration ergy. sis of n

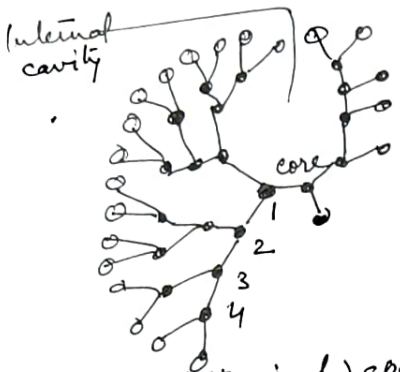
SPECIALITY POLYMERS

DENDRIMERS / dendritic / starburst / cascade polymers.

derived from dendron → tree

Dendrimers are a new class of polymeric materials. They are highly branched, monodisperse macromolecules. The st. of these materials has a great impact on their physical & chemical properties.

hyperbranched
well defined dendritic polymers.



The no. of focal points when going from the core towards the dendrimer surface is called generation no. i.e. a dendrimer having 5 focal points going from centre to the periphery is a 5th generation dendrimer.

Dendrimer synthesis :- In two ways { Divergent / convergent

(i) **Divergent :-** Molecules assemble from core to the periphery.

(ii) **convergent :-** Dendrimer is constructed stepwise starting from the end gp and progressing inwards. when the arms/ of dendrons are large enough, they are attached to a multi-functional core molecule.

Characteristics :-

→ They consist of 3 parts (a) a central core, (b) an interior dendritic st. (c) an exterior surface

→ Each type of synthesis is normally by a repetitive sequence of steps so their macromolecular dimensions are easily controlled

→ They have high surface functionality hence are more soluble than linear polymers.

→ Their solutions have low viscosities.

→ Their molecules are in the range of 1-100 nm. There is a limit to the size of dendrimers or dendrimer segments because of steric congestion.

Applications :-

→ Dendrimers are suitable for a wide range of biomedical and industrial applications.

→ They find use in biology, respond to the surrounding chemical environment showing altered conformational behaviour upon changes in pH, solvent polarity & ionic strength.

→ They show specific applications because of the presence of internal cavities in which they encapsulate the guest molecules.

→ Dendrimers are used for targeted delivery of drugs and other therapeutic agents. Drug molecules can be loaded both in the interior of the dendrimers as well as attached to the surface groups.

→ ~~Light~~ Dendrimers are also used as light harvesting units as they absorb light of higher energy and ~~re~~ re-emit it in the form of lower energy ~~beam which passes~~ to the acceptor molecules and thus they transfer the energy of light.

(2) Ion-Exchange Resins → cation and → Anion Ex-resins] Explain from unit-4.