

Biodegradable Plastics - Overview



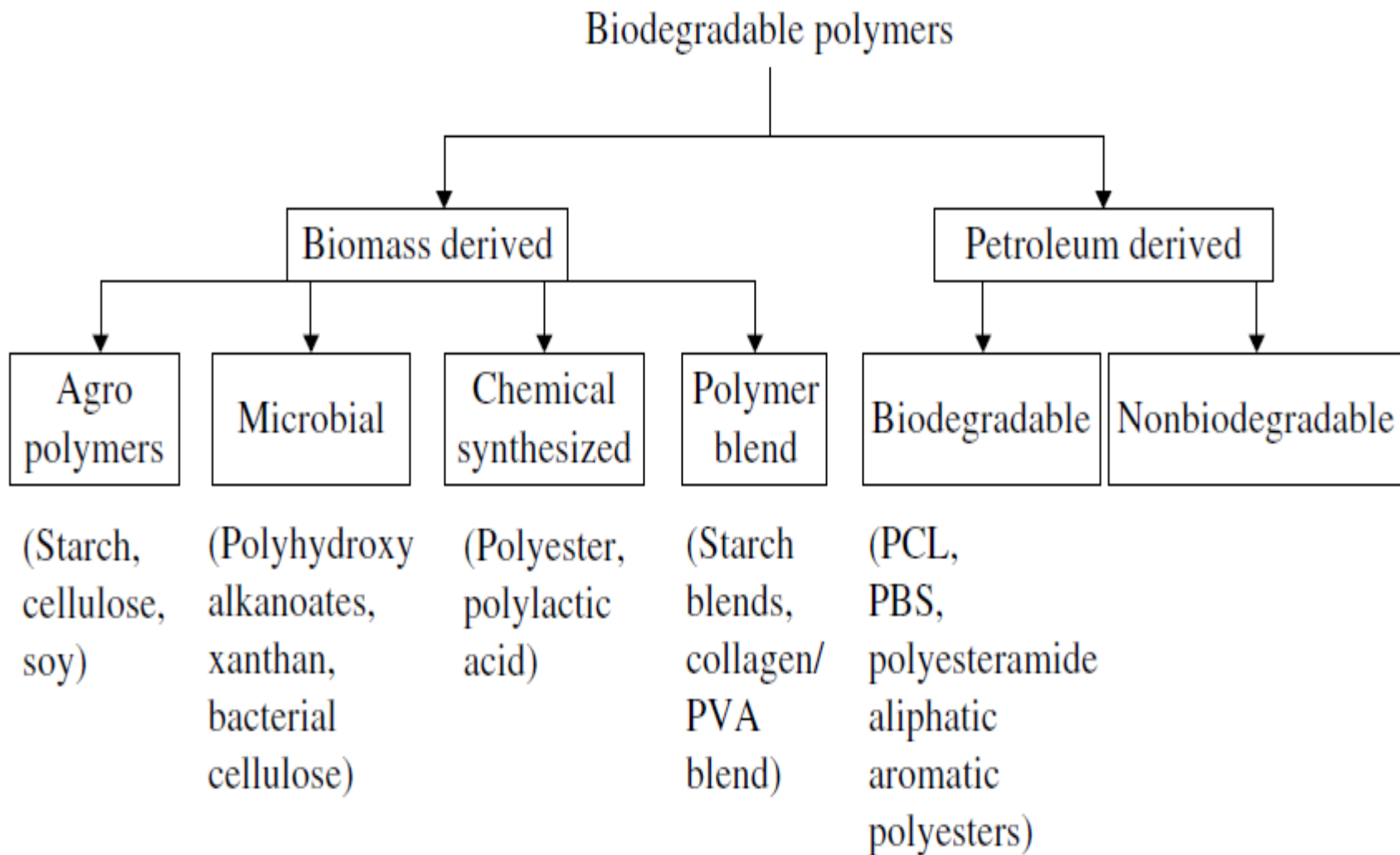
Dr.S.S.M.Abdul Majeed

Professor & Head

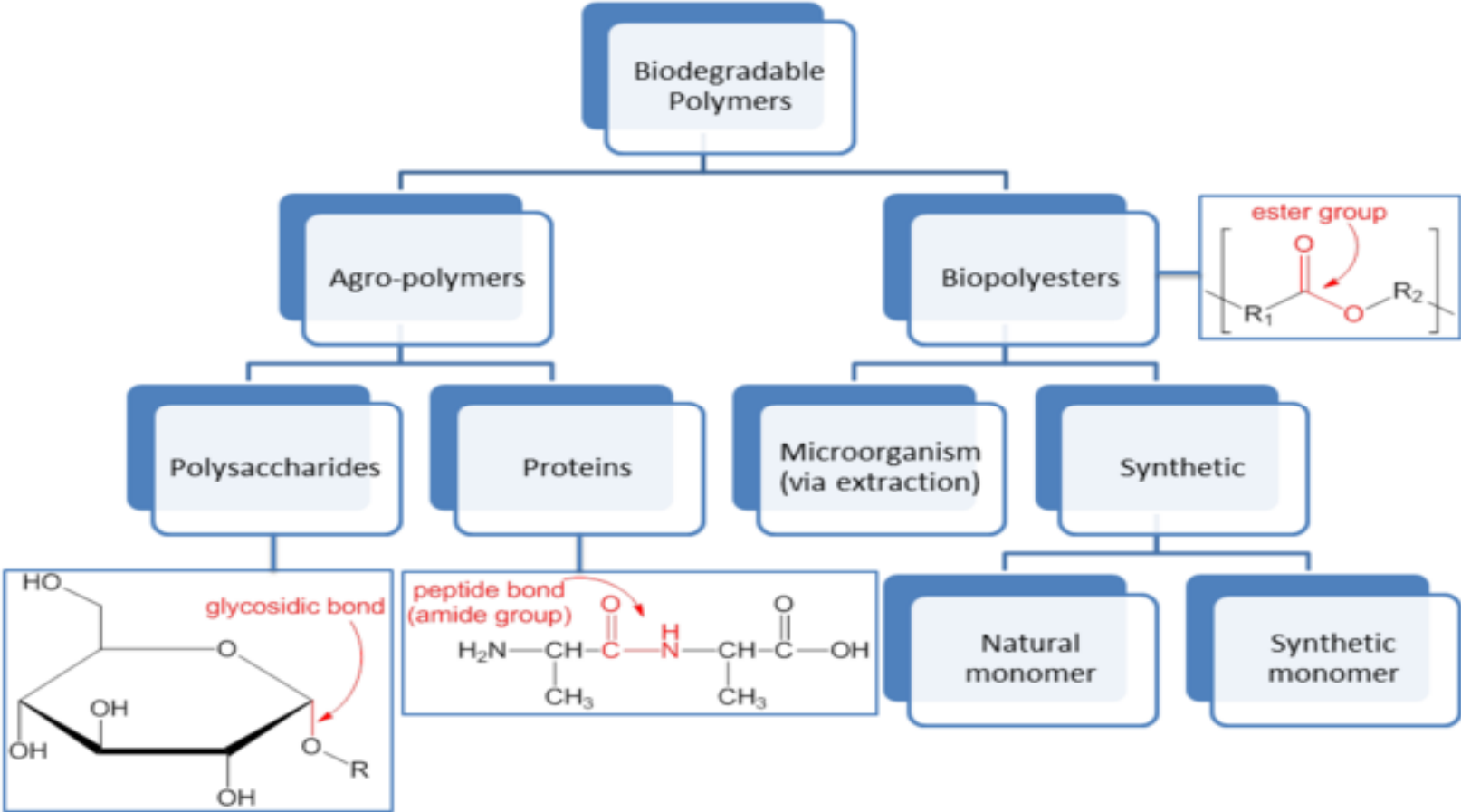
Department of Polymer Engineering

*B.S.Abdur Rahman Crescent Institute
of Engineering and Technology*

Classification

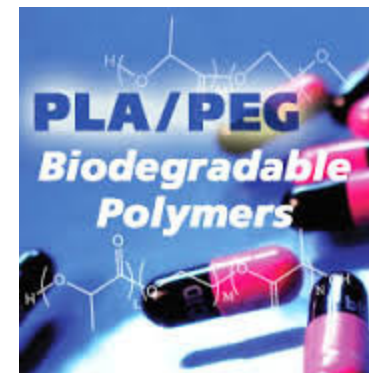


Classification...



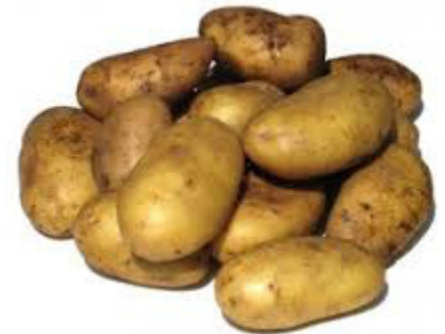
Biopolymers From Natural Origins

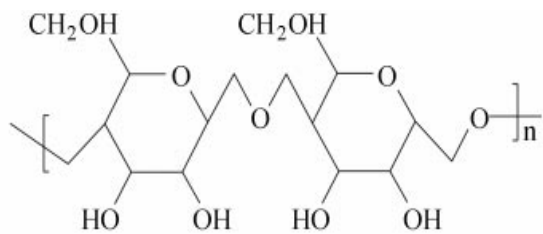
- **Polysaccharides**
(e.g., starch, cellulose, lignin, chitin)
- **Proteins**
(e.g., gelatine, casein, wheat gluten, silk and wool)
- **Lipids**
(e.g., plant oils including castor oil and animal fats)
- **Polyesters produced by micro-organism or by plants**
(e.g., polyhydroxy- alcanoates, poly-3-hydroxybutyrate)
- **Polyesters synthesised from bio-derived monomers**
(polylactic acid)
- **Group of miscellaneous polymers**
(natural rubbers, composites).



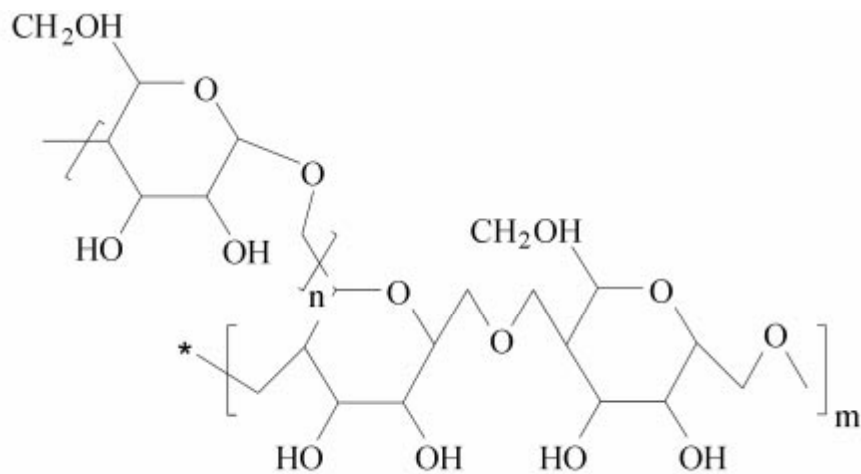
Polysaccharides

- **Starch polymers**
- D-glucose organised in two major constituents : amylose and amylopectin.
- **Amylose** contains amorphous and crystalline regions. It forms a linear structure constituted by repeating units of 1-4-glucose.
- **Amylopectin** is branched on amylose in starch





Structure of amylose



Structure of amylopectin

Proteins

- **Collagen and gelatine**

Well-known animal polymers

- **Collagen**

a relatively non-extensible protein

- **Gelatine**

derives from the physical and chemical denaturising of collagen

- **Casein**

extracted from skim milk proteins

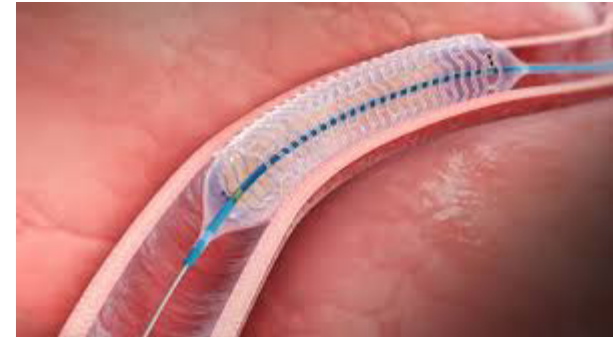
- **Wheat and corn gluten**

flexible, resistant, transparent, and completely biodegradable

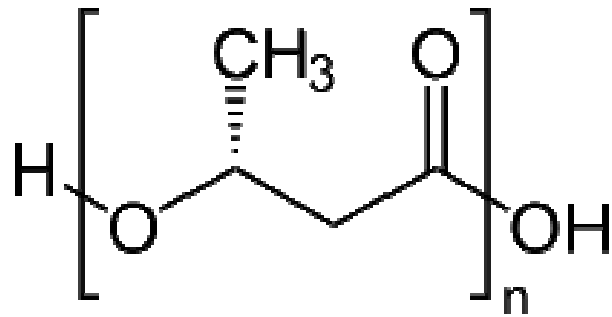
- **Soy proteins**

- **Lipids**

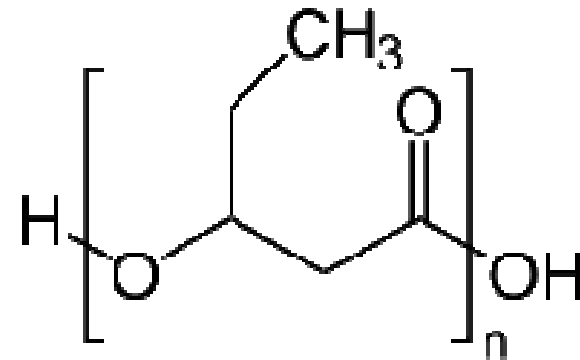
Plant oils and animal fat



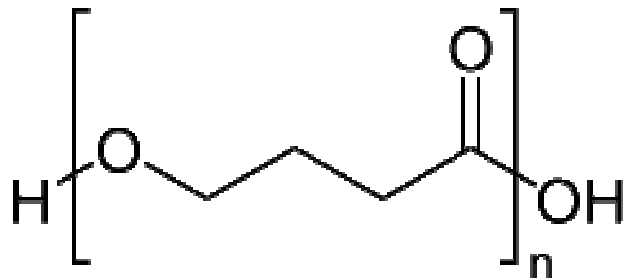
Bacterial Plastics



Polyhydroxyalkanoate (PHA)



Poly-3-hydroxyvalerate (PHV)



Polyhydroxybutyrate (PHB)



Biopolymers From Mineral Origins

- **Aliphatic polyesters**

(e.g., polyglycolic acid, polybutylene succinate, polycaprolactone)

- **Aromatic polyesters**

(e.g., polybutylene succinate terephthalate)

- **Polyvinylalcohols**

- **Modified polyolefins**

(polyethylene or polypropylene with specific agents)



Biopolymers from Mineral Origins

- **Aliphatic polyesters**

Polyglycolic acid (PGA), polylactic acid (PLA), polycaprolactone

- **Aromatic polyesters**

Polybutylene succinate terephthalate

- **Polyvinylalcohols (PVA)**

Bioplastics Market Share

- Cellulose acetate
- Extruded Starch
- Polyhydroxyalkanoates (PHAs) and others
- Polylactic Acid (PLA)
- Thermoplastic Starch/ Blends

