Mechanical Properties

The mechanical behavior of a polymer can be characterized by its stress–strain properties.

1. **Modulus**
2. **Ultimate Strength or Tensile Strength**
3. **Ultimate Elongation**
4. **Elastic Elongation**

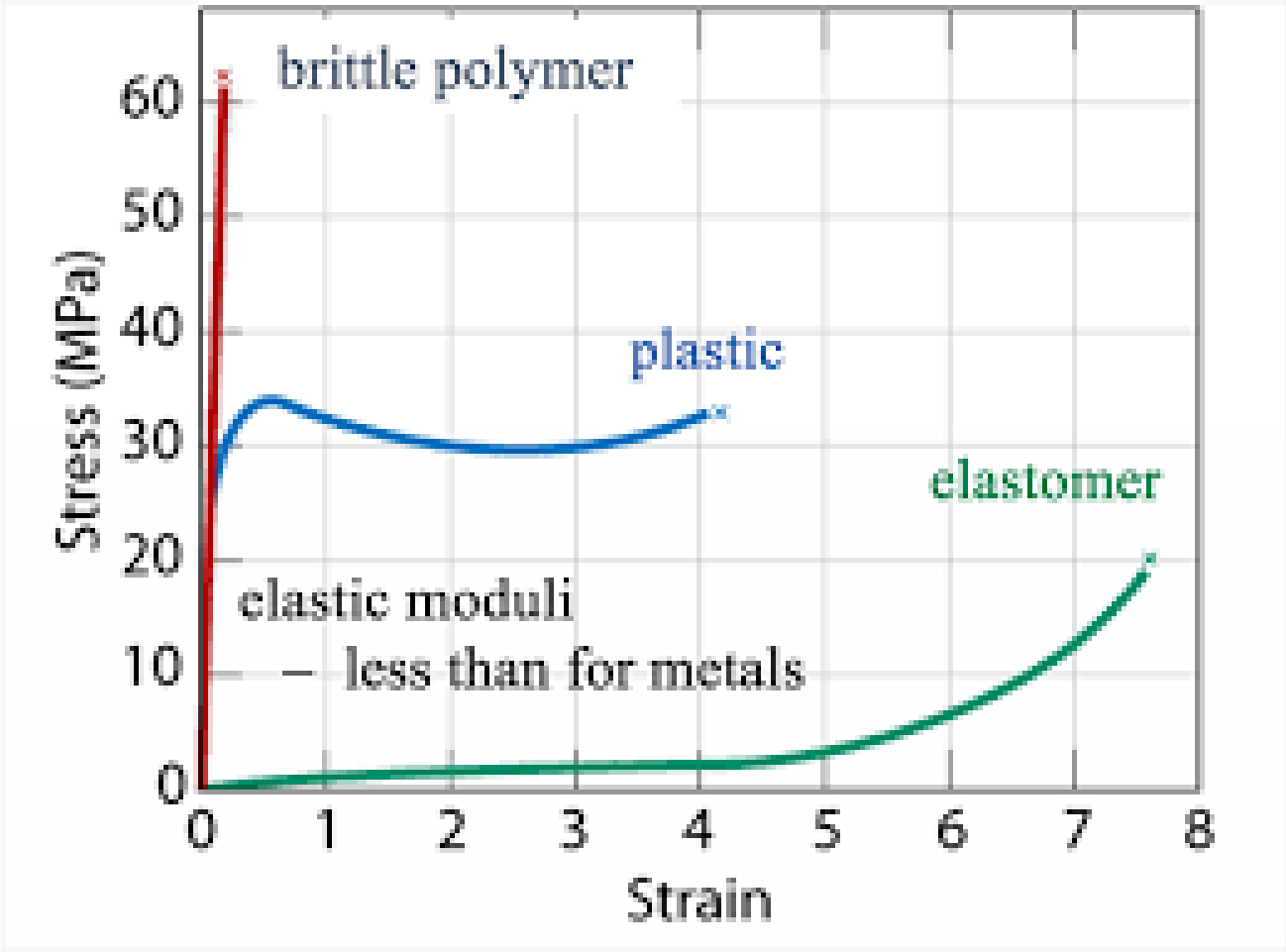


Fig. Stress–strain plots for a typical elastomer, flexible plastic, rigid plastic, and fiber

Types of Polymers based on Use

Elastomers	Plastics	Fibers
Polyisoprene	*Polyethylene*	
Polyisobutylene	*Polytetrafluoroethylene*	
	Poly(methyl methacrylate)	
	Phenol–formaldehyde	
	Urea–formaldehyde	
	Melamine–formaldehyde	
	←— *Polystyrene* —→	
	←— *Poly(vinyl chloride)* —→	
	←— *Polyurethane* —→	
	←— *Polysiloxane* —→	
		←— *Polyamide* —→
		←— *Polyester* —→
		←— *Cellulosics* —→
		←— *Polypropene* —→
		Polyacrylonitrile

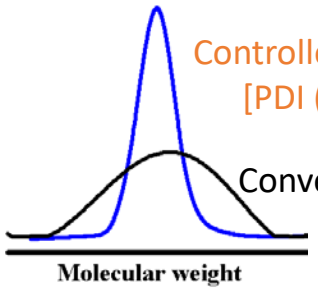
Reversible Deactivation Radical Polymerization

Controlled/Living polymerization or RDRP — where chain-breaking reactions such as termination and transfer are absent and all chains are instantaneously initiated and grow simultaneously

- ❑ Ionic polymerizations
  - Cationic polymerization
  - Anionic polymerization
- ❑ Ring-opening polymerization (ROP)
  - Cationic ROP
  - Anionic ROP
- ❑ Controlled radical polymerizations
  - Atom transfer radical polymerization (ATRP)
  - Stable free radical polymerization (SFRP)
  - Reversible addition-fragmentation chain transfer (RAFT) polymerization

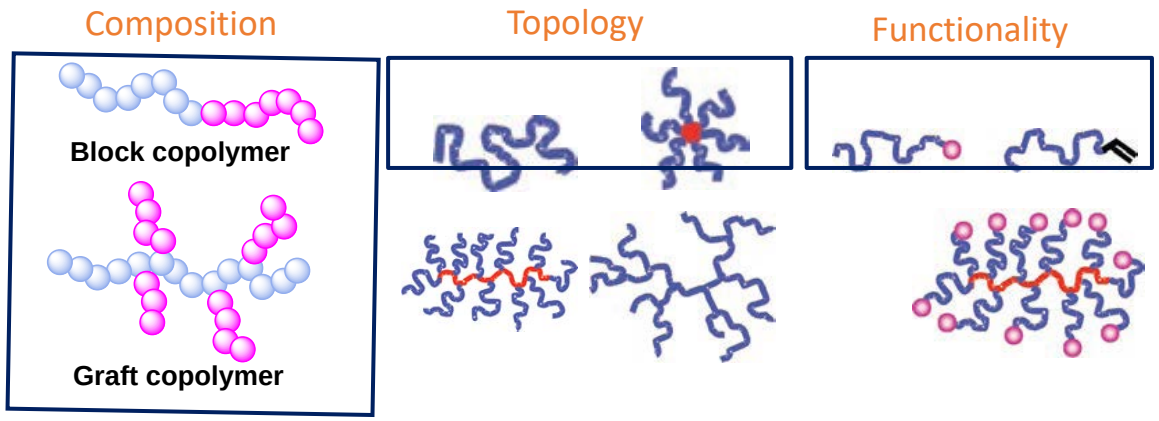
Advantages…….

❑ Narrow polydispersity (PDI)

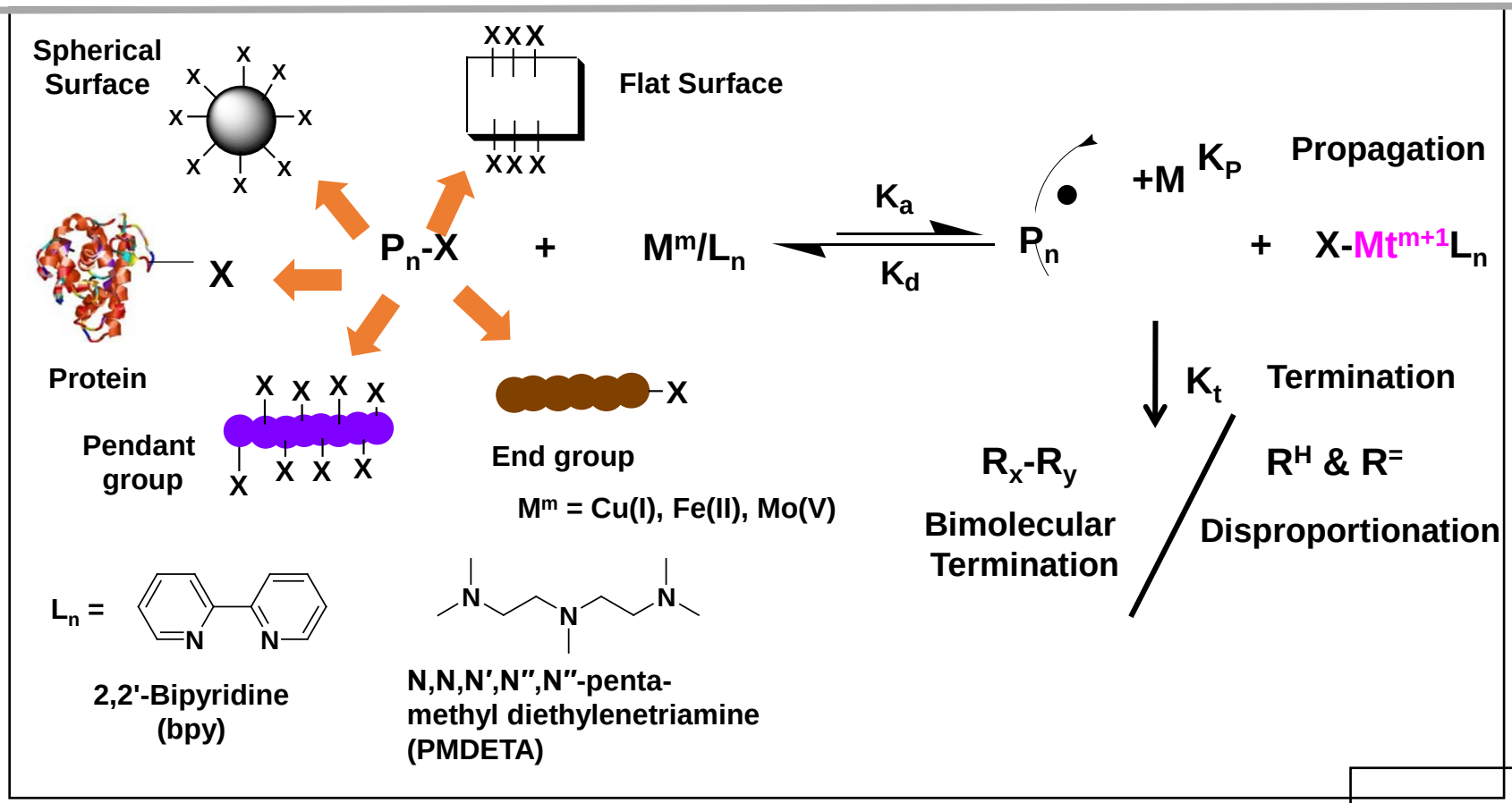


Molecular weight distributions

❑ Good control over macromolecular architectures



Atom Transfer Radical Polymerization



Advantages

- ✓ Applicable to a large number of functional monomers
- ✓ Control over macromolecular architectures
- ✓ Synthesis of block/graft copolymers is possible