

---

# POLYMER PROPERTY RELATIONSHIPS AND ANALYSIS



# Contents

**Introduction to Polymer Properties**

01

**Effect of Polymer Structure**

02

**Structure vs Properties**

03

**Applications**

04



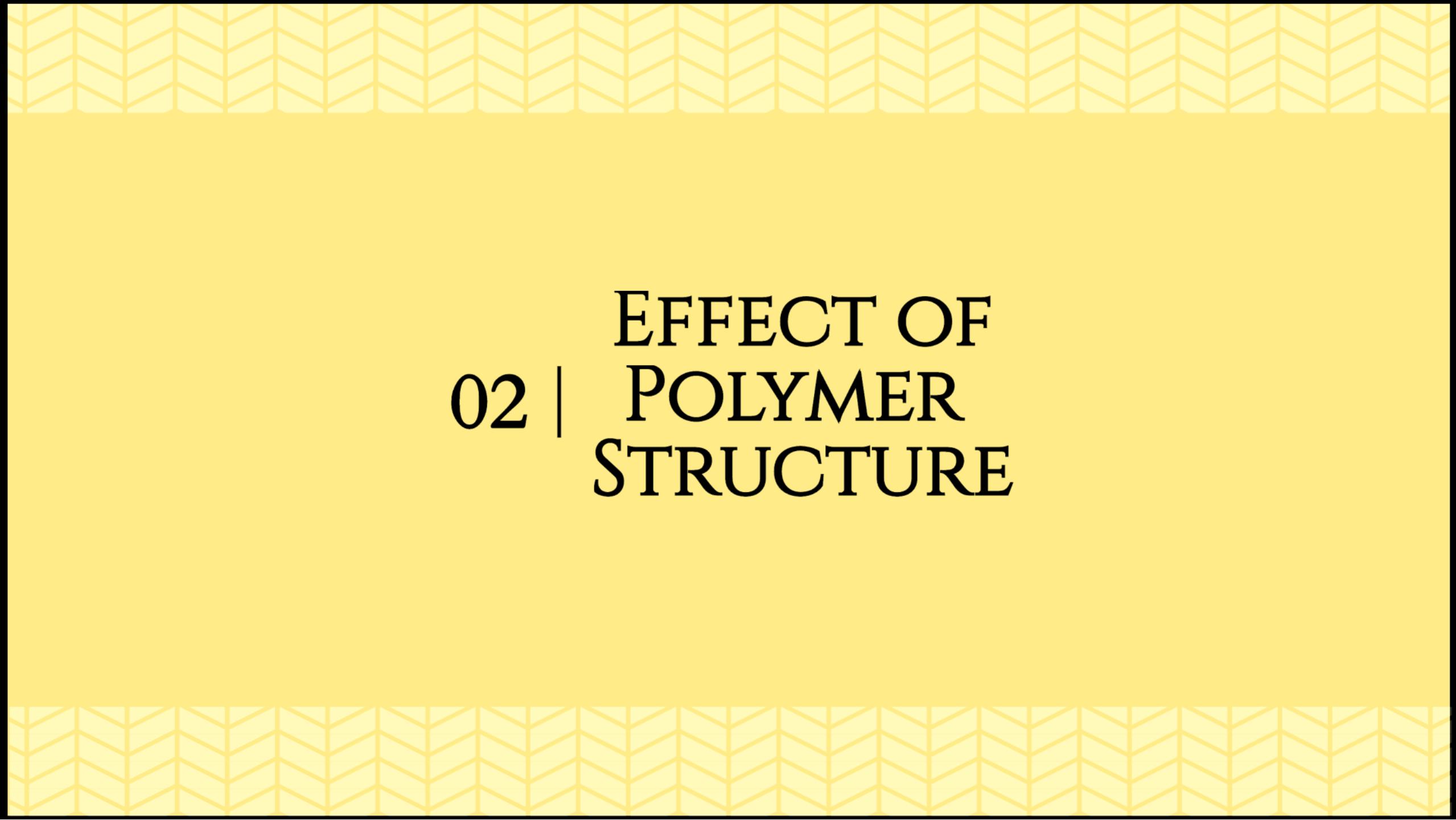
01 |

# INTRODUCTION TO POLYMER PROPERTIES

# Overview of Polymer

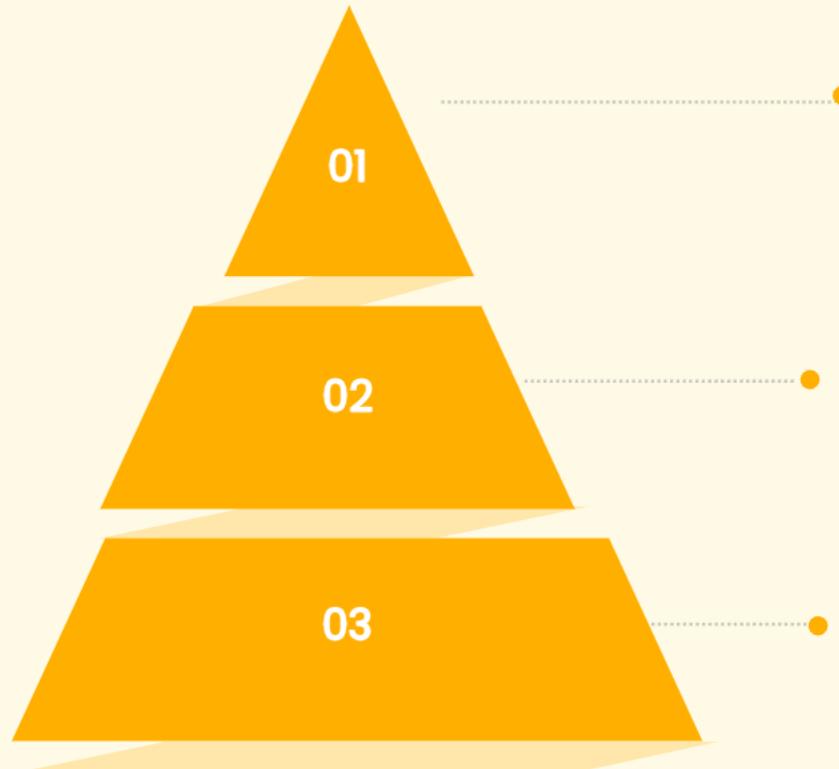
- Polymers are made of long chains of repeating units (monomers).
- The molecular structure of a polymer strongly influences its physical, mechanical, and thermal properties.
- Understanding this relationship helps in selecting polymers for specific applications.





## 02 | EFFECT OF POLYMER STRUCTURE

# Key Structural Factors



## Chain Length (Molecular Weight):

Longer chains → higher strength and toughness

## Chain Arrangement:

Linear → flexible, easily packed

Branched → lower density, more flexible

Cross-linked → rigid and strong

## Crystallinity:

More crystalline → higher stiffness and melting point

# 03 | STRUCTURE VS PROPERTIES

# How Structure Affects Properties



01

## Linear polymers

High tensile strength (e.g., HDPE)

02

## Branched polymers

Softer and lower density (e.g., LDPE)

03

## Cross-linked polymers

High thermal and chemical resistance (e.g., Bakelite)

04

## Amorphous polymers

Transparent and flexible

05

## Crystalline polymers

Opaque and rigid

# 04 | APPLICATIONS

# Applications

## ✉️ Based on Structure

Property Relationship

## 📦 Pipes and containers

linear polymers (HDPE)

## 📁 Flexible packaging

Branched polymers (LDPE)

## ⌚ Electrical switches

Cross-linked polymers (Bakelite)

## 🧵 Fibers and textiles

Highly crystalline polymers (Nylon, Polyester)



---

# Thanks

