Polypropylene

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Introduction

- Thermoplastic
- Grades Available
  1. Homopolymers - plastic film products, caps and closures, pipes
  2. Block Copolymers - automotive, toys, appliances
  3. Random Copolymers
- Types of polypropylene (isotactic, atactic, syndiotactic)
Polypropylene Synthesis

- Reaction - \( \text{MAO} \rightarrow \)
- Addition polymerization of propylene
- Methylaluminumoxane \(-\text{Al}(\text{CH}_3\text{O})\text{-}\)\(_n\).
- Polypropylene synthesis via Kaminsky Catalysts, MAO and propylene monomer
- Kaminsky Catalysts based on metallocenes (Ti, Zr, Hf, Rf)
Polypropylene Synthesis Cont.

- Radical polymerization results in atactic polymer –

- Addition via Kamensky catalyst results into isotactic and syndiotactic polypropylene –
Physical and Chemical Properties

- Molar Mass between 50,000 – 200,000 g/mol
- Density – 0.905g/cm³
- Melting point of 338 °F (160 °C)
- Little more brittle than polyethylene
- Can be melted and recycled
- Good electrical insulator
- Good chemical resistance (alcohols, acids, dilute alkalis)
- Good heat resistance
- Good resistance to fatigue
Manufacturing Processes

• Injection Molding
  Automated Computer Controlled injection molding machine

• Extrusion Blow molding
Typical Products Produced by Each Method

• Injection Molding
  Power-tool housings, safety helmets, telephone handsets, television cabinets washing-up bowls

• Extrusion Molding
  Bottles and containers, automotive fuel tanks, venting ducts, watering cans, boat fenders etc
Conclusions

- Wide application and usefulness
- Very good thermal, electrical, chemical properties