# IAPD Thermoplastics Rectangle

## Characteristics

### Imidized

- **Key Characteristics**
  - Very high cost per pound
  - Excellent physical properties above 400 degrees F
  - Excellent electrical properties
  - Excellent dimensional stability
  - Low coefficient of friction (COF)

### Amorphous High Performance Thermoplastics

- **Key Characteristics**
  - High cost
  - High temperature
  - High strength and good stiffness
  - Good chemical resistance
  - Transparent
  - Hot water and steam resistance

- **Materials**
  - Polysulfone (PSU)
  - Polyetherimide (PEI)
  - Polyethersulfone (PES)
  - Polyamidesulfone (PAS)
  - Polyaryletherketone (PAEK)

### Semi-Crystalline High Performance Thermoplastics

- **Key Characteristics**
  - High cost
  - High temperature
  - High strength
  - Good chemical resistance
  - Good electrical properties
  - Low COF
  - Good toughness

- **Materials**
  - Polyvinylidene Fluoride (PVDF)
  - Polytetrafluoroethylene (PTFE)
  - Ethylene-Chlorotrifluoroethylene (ECTFE)
  - Fluorinated Ethylene Propylene (FEP)
  - Polychlorotrifluoroethylene (PCTFE)
  - Perfluoroalkoxy (PFA)
  - Polyphenylene Sulphide (PPS)
  - Polyetheretherketone (PEEK)

### Amorphous Engineering Thermoplastics

- **Key Characteristics**
  - Moderate cost
  - Moderate temperature resistance
  - Good to excellent impact resistance
  - Good dimensional stability
  - Good optical qualities
  - Translucency

- **Materials**
  - Polycarbonate (PC)
  - Polypolyene Oxide (Mod PPO)
  - Polymethylpentene (PMP)
  - Thermoplastic Polyurethane (TPU)

### Semi-Crystalline Engineering Thermoplastics

- **Key Characteristics**
  - Moderate cost
  - Moderate temperature resistance
  - Good chemical resistance
  - Good bearing and wear properties
  - Low COF
  - Difficult to bond

- **Materials**
  - Nylon (PA)
  - Acetal (POM)
  - Polyethylene Terephthalate (PET)
  - Ultra High Molecular Weight Polyethylene (UHMW-PE)

### Amorphous Commodity Thermoplastics

- **Key Characteristics**
  - Low cost
  - Low temperature resistance
  - Low strength
  - Good dimensional stability
  - Transparent (typically, but not always)

- **Materials**
  - Acrylic (PMMA)
  - Polystyrene (PS)
  - Acrylonitrile Butadiene Styrene (ABS)
  - Polyvinyl Chloride (PVC)
  - Polyethylene Terephthalate Glycol (PETG)
  - Cellulose Acetate Butylate (CAB)

### Semi-Crystalline Commodity Thermoplastics

- **Key Characteristics**
  - Low cost
  - Low temperature resistance, strength
  - Low COF
  - Near zero moisture absorption
  - Good electrical properties, toughness
  - Difficult to bond

- **Materials**
  - High Density Polyethylene (HDPE)
  - Low Density Polyethylene (LDPE)
  - Polypropylene (PP)
  - Polymethylpentene (PMP)

### Amorphous Key Characteristics

- Soften over a broad range of temperatures
- Easy to thermoform
- Tend to be translucent
- Bond well using adhesives and solvents
- Prone to stress cracking
- Poor fatigue resistance
- Structural applications only (not bearing and wear)

### Semi-Crystalline Key Characteristics

- Sharp melting point
- Difficult to thermoform
- Tend to be opaque
- Difficult to bond using adhesives and solvents
- Good resistance to stress cracking
- Good fatigue resistance
- Good for bearing and wear and structural applications