

When to use which material

Each material used in FRC has distinct mechanical and manufacturing properties that determine how it behaves under load, during machining, and in real-world robot use.

6061-T6 Aluminum

- High strength and stiffness
 - Excellent machinability
 - Holds tapped threads well
 - Maintains shape under load with minimal flex
 - Can be anodized for corrosion resistance
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5052 Aluminum

- High ductility (bends without cracking easily)
 - Lower strength than 6061-T6 in rigid structures
 - Very good fatigue resistance in sheet form
 - Poor thread-holding capability compared to 6061
 - Excellent for forming and sheet fabrication
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Polycarbonate

- Extremely high impact resistance (does not shatter)
 - Flexible and can bend significantly before failure
 - Transparent, allowing visibility through panels
 - Sensitive to heat during machining
 - Crack-resistant compared to brittle plastics like acrylic
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SRPP (Glass-Filled Polypropylene)

- Lightweight with moderate stiffness
- High vibration damping compared to metals
- More rigid than standard plastics due to glass fill
- Low density relative to aluminum
- Good fatigue resistance in sheet applications

Steel

- Very high strength and hardness
- Excellent wear resistance
- High density (heavy compared to aluminum)
- Maintains shape under extreme loads
- Can be heat-treated for increased hardness

Plywood

- Cross-laminated structure resists splitting
- Good stiffness for its weight
- Anisotropic (strength depends on grain direction)
- Absorbs impact energy without immediate fracture
- Sensitive to moisture and environmental conditions

Key Idea

Each material behaves differently under stress, machining, and impact. Understanding these unique properties allows FRC teams to choose the right material for strength, weight, flexibility, and durability requirements.

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