

Jute-Epoxy Composites: Finding the "Sweet Spot" for Sustainable Strength

Maximizing performance and sustainability through optimal fiber reinforcement.

CONTEXT: Jute-Epoxy Composites

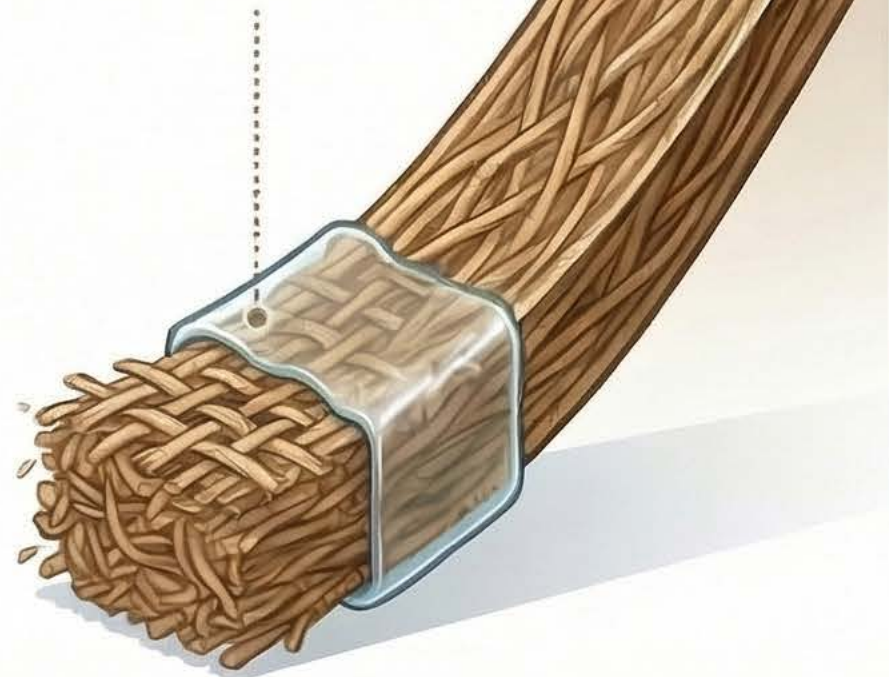
Untreated jute fiber reinforced epoxy composites tested from 5% to 25% fiber weight fractions. A critical performance peak is identified at 20%, offering a sustainable, lightweight alternative for automotive and structural use.



THE 20% PEAK & MECHANICAL PERFORMANCE

5% (Initial)

- Tensile Strength: 65 MPa
- Flexural Strength: 100 MPa
- Impact Energy: 12 J



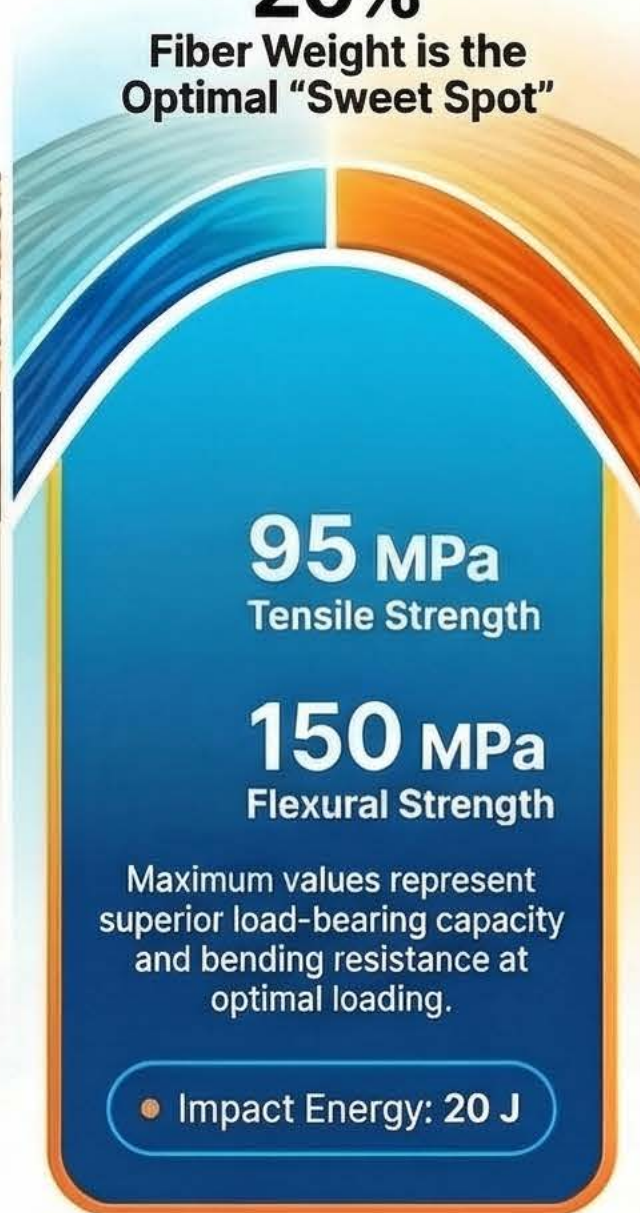
20% Fiber Weight is the Optimal "Sweet Spot"

95 MPa
Tensile Strength

150 MPa
Flexural Strength

Maximum values represent superior load-bearing capacity and bending resistance at optimal loading.

- Impact Energy: 20 J



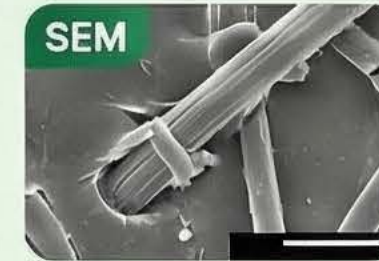
25% (Decline)

- Tensile Strength: 90 MPa
- Flexural Strength: 145 MPa
- Impact Energy: 18 J

Mechanical performance peaks at 20% wt before declining due to fiber clustering and voids.



SUSTAINABILITY & MICROSTRUCTURAL INTEGRITY



Effective Crack-Bridging at Mid-Range Loading:

SEM analysis shows fibers successfully arrest cracks and distribute stress at 15-20% loading.



Eco-Friendly Structural Alternative

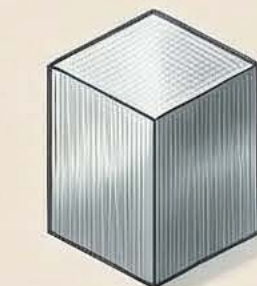
Jute offers low carbon footprint, biodegradability, and high availability compared to carbon fibers.

Target: Automotive Interior Components

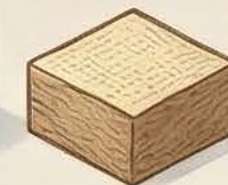
Ideal for door trims, dashboards, and parcel shelves requiring vibration damping and safety.



COMPARATIVE ADVANTAGE



Traditional Synthetic Systems (e.g., Glass Fiber)



Jute-Epoxy Composites (20% wt)

30%-40%

Weight Reduction Over Synthetic Systems

Jute composites provide significant weight savings compared to traditional glass fiber systems.