Physical and Chemical Properties of Walnut Shell

1. Physical Properties:

- **Appearance:** Hard, fibrous shell with a brown color
- **Particle Size:** Varies (fine, medium, coarse depending on processing)
- **Bulk Density:** 0.8 - 1.2 g/cm^3
- **Hardness (Mohs Scale):** 3.0 - 4.0
- **Specific Gravity:** 1.2 - 1.4
- **Porosity:** Highly porous structure
- **Moisture Content:** 5 - 10%
- **Odor:** Odorless
- **Solubility in Water:** Insoluble

2. Chemical Composition:

- **Cellulose:** 40 - 50%
- **Lignin:** 20 - 30%
- **Hemicellulose:** 15 - 25%
- **Protein:** 3 - 5%
- **Ash Content:** 1 - 3%
- **Extractives (Fats, Oils, Waxes):** 1 - 5%
- **pH:** 4.5 - 6.5

3. Thermal Properties:

- **Combustion Temperature:** 400 - 600°C
- **Calorific Value:** 4000 - 4500 kcal/kg
- **Thermal Stability:** Decomposes at high temperatures

4. Mechanical Properties:

- **Impact Resistance:** High

- **Compression Strength:** Moderate

5. Functional Properties:

- **Biodegradability:** 100% biodegradable
- **Absorption Capacity:** High absorption for oils and chemicals
- **Resilience:** Good resistance to breakage under mechanical stress

Conclusion: Walnut shell possesses unique physical and chemical characteristics, making it suitable for applications in filtration, abrasives, biofuels, and eco-friendly products.