D.PHARM • FIRST YEAR

Pharmaceutics

CHAPTER 2

Packaging Materials



ENGLISH CHAPTER NOTES

DIPLOMA IN PHARMACY

PACKAGING: FUNCTIONS & LEVELS

Packaging encloses and protects a product during storage, distribution and use.

1. PRIMARY PACKAGING

- Direct contact with the medicine.
- Examples: bottles, blisters, tubes and sachets.
- Protects the formulation and preserves its quality.



2. SECONDARY PACKAGING

- Surrounds or groups primary packs.
- Examples: cartons, paperboard boxes and shrink wraps.
- Adds protection and carries product information.



3. TERTIARY PACKAGING

- Supports bulk storage and transport.
- Examples: shipping cartons, pallets and stretch film.



4. MAIN FUNCTIONS

- Limits contamination, moisture, physical damage and tampering.
- Supports shelf-life, convenient handling and clear instructions.
- The complete pack must protect the medicine until use.



PACKAGING CLASSIFICATION

Classify a pack by its stage, material, product and physical design.

BY DESIGN

- **Flexible**: pouches, sachets and bags.
- **Rigid**: bottles, jars and cans.
- **Semi-rigid**: tubes and blister packs.

Flexible



Rigid



Semi-rigid



BY PRODUCT

- Pharmaceutical, food, cosmetic, chemical and other consumer packaging.
- Composite layers combine useful properties of different materials.



BY MATERIAL

Glass

- **Glass**: non-porous containers with strong barrier properties.



Plastic

- **Plastic**: lightweight materials such as PE, PP, PVC and PET.



Metal

- **Metal**: aluminium foil, tubes and steel containers.



Rubber

- **Rubber**: elastic stoppers and seals.



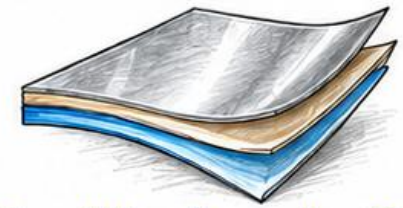
Paper and paperboard

- **Paper and paperboard**: cartons and shipping protection.



Laminates

- **Laminates**: combined layers, such as plastic with aluminium foil.

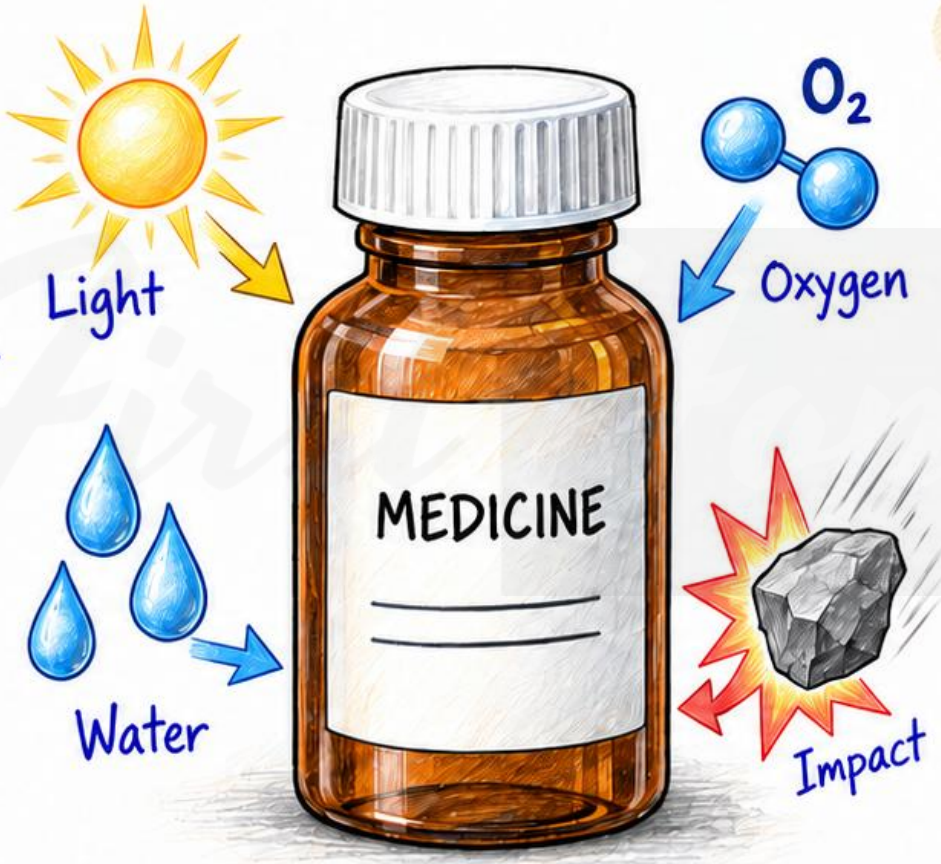


SELECTION OF PACKAGING MATERIALS

Select the container and closure together for the specific formulation.

PRODUCT PROTECTION

- Compatibility: avoid reactions, contamination and drug loss.
- Barrier: control moisture, oxygen, light and microbial entry.
- Mechanical strength: resist impact, compression, vibration and puncture.
- Temperature tolerance: withstand intended storage and processing.



PRACTICAL REQUIREMENTS

- Cost: balance protection with production and transport expense.
- Appearance: allow clear identification, printing and inspection where needed.
- Environment: consider recycling, reuse and waste without weakening protection.
- Compliance: meet applicable pharmacopoeial and regulatory requirements.



Suitability needs evidence from compatibility and stability testing.

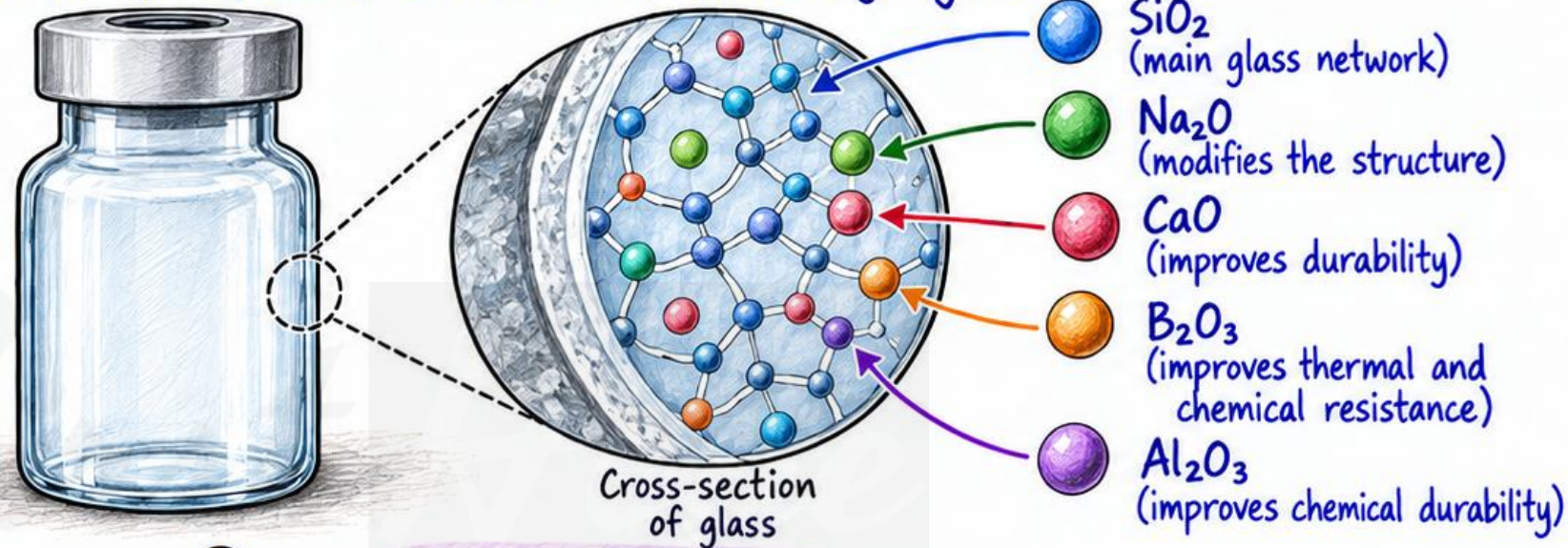


GLASS: COMPOSITION & RESISTANCE

Glass serves in vials, ampoules, bottles and prefilled syringes.

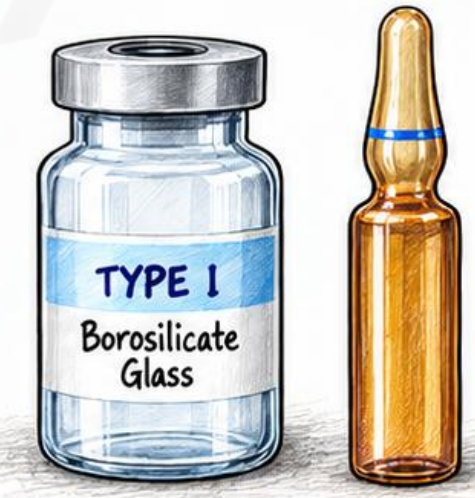
COMPOSITION

- SiO_2 forms the main glass network.
- Na_2O modifies the structure.
- CaO improves durability.
- B_2O_3 improves thermal and chemical resistance.
- Al_2O_3 improves chemical durability.



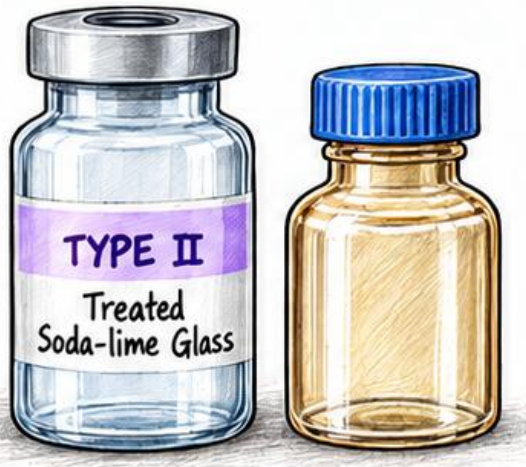
TYPE I

- Borosilicate glass has high hydrolytic resistance through its composition.
- Commonly suitable for parenteral and nonparenteral products after compatibility testing.
- Low thermal expansion helps resist thermal shock.



TYPE II

- Treated soda-lime glass gains surface hydrolytic resistance.
- Suitable for many acidic and neutral aqueous products.
- Alkaline formulations need particular compatibility assessment.



★ Glass type guides selection, but product-specific evidence remains essential.

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