Jars, tubes, dispensers etc – cosmetic packaging

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The packaging of skin care products serves for product protection but also is intended to persuade people to buy. What particular functions and requirements are important for the packaging of cosmetic products?

The four main aspects that matter for the selection of a cosmetics container are the type of container, compatibility, functionality and the protection of the products.

Depending on the purpose

The type of packaging depends on the particular application and the product to pack. Each container has its advantages and disadvantages and the pros and cons have to be weighed in each individual case.

Table: Containers for skin care products

Container type	Purpose	Advantages	Disadvantages
Jars (plastics, glass, ceramic)	**Home care** • Semi-solid W/O and O/W emulsions • Hydrogels • Oleogels	• Filling easy to take out with fingers, spatula or cotton pads • Decorative • Small sizes are suitable for handbags and travel • Can be completely emptied	• Unhygienic – contamination during • High concentrations of preservatives required • Condensed water on lid inside may cause mould • O/W products may desiccate • Not suitable for volatile components
Tubes (plastics, composite materials, aluminium)	**Home care** • Semi-solid W/O and O/W emulsions • Hydrogels • Oleogels	**Aluminium** • The “one-way discharge” from aluminium tubes avoids the penetration of germs	• Non-decorative “ointment-look” • Elastic plastic tubes let air and germs penetrate during discharge
Bottles (plastics, glass, ceramics, aluminium)	**Home care, beauty institute products** • Liquid W/O and O/W emulsions • Solutions • Refill bottles	**Variable synthetic materials** • Jet and drop inserts • Spray nozzles • Frothing caps • Pump heads with tube **Glass/rubber** • Pipette kits with rubber sealing for sera (instead of ampoules) **Aluminium** • Aluminium pressure cylinders (CO2, propane, butane): hygienic “one-way discharge”	• Requires high microbiological stability (air and germs may penetrate when opening) • Radiation can penetrate through transparent bottles, hence they are not appropriate for sensitive components • With higher viscous contents, pump heads with tubes may cause a funnel formation and hence impede the emptying • Aluminium containers are easily dented
Dispensers (plastics, glass)	**Home care** • Semi-solid emulsions • Hydrogels • Oils, liquid waxes • Lotions	• Hygienic: airless dispensers with double bottom (plastic) cannot be contaminated from the outside • Airless dispensers can be completely emptied (disadvantage: abrupt stop of product discharge when dispenser is empty)	• Transparent dispensers are not accepted in some countries • Radiation can penetrate through transparent dispensers, hence they are not appropriate for sensitive components

Container type	Purpose	Advantages	Disadvantages
Cans (plastics, glass)	**Home care, beauty institute products** • Refill cans • Powders • Bath tablets	• Wide opening	• High surface powders absorb water from the air at frequent opening
Ampoules (glass, plastics)	**Beauty institute products** • Sera • Active agent concentrates • Solutions • Oxygen-sensitive products	• Sterile content • Hygienic • Small container • Unbreakable (plastic)	• Non-preserved content has to be consumed immediately after opening • Sample taking is impossible • Risks of injury when opening glass ampoules • Breakable (glass)
Sachets (plastic foils)	**Home care, beauty institute products** • Enzyme peeling (powder) • Modelages (powder) • Free samples of semi-solid W/O and O/W emulsions	• Hygienic • One-off use • Promotion material	• Opened products have to be consumed immediately • Lots of packaging waste

The products in the containers listed in the table that come in contact with the outside air become contaminated with germs and thus, they usually contain more preservatives. In microbiological terms, these containers have to be handled like jars which are subject to carry the open jar symbol, as is generally known. This consumer information symbol indicates the period of use in months after opening the product, as for instance 3 M which means 3 months. Although it actually makes no sense that airless dispensers bear the symbol, it is required by law.

Material characteristics

Besides the basic purpose and the microbiological and physical aspects, also the compatibility of container materials and content is of significance. Stability measurements are carried out over a longer period though before the container material is actually used. Very often a whole series of different materials have to be taken into consideration. Just to state an example in this context: the insides of an airless dispenser consist of one or of several different types of plastic, flexible sealing gaskets (made of elastomers) and possibly a spring made of blank, zinc-coated or laminated steel. The following examples show the potential problems involved with the different types of materials:

Plastics

- Essential oils may diffuse into plastics and potentially even have dissolving effects depending on their specific chemical composition. Polypropylene (PP) is one of the most resistant plastic materials, if in doubt however, it is recommended to select glass or ceramics.
- Various synthetic materials absorb short-chained esters which then have plasticizing effects.
- Short-chained amphiphilic preservatives also are absorbed by plastics and sealing gaskets. This may result in a reduced concentration of preservatives, possibly even below the minimal inhibitory concentration with the effect that the product will become microbiologically instable with longer storage.
- The double wall jar is not intended as a bluff package though: the hard outer jar made of styrene-acrylonitrile (SAN) is more appropriate for decorative purposes (surface, imprint) than the softer polypropylene inner jar that provides higher product stability.
- Plastics may embrittle due to the release of substances into the filling material. Even double wall jars may show fissures on the outer jar after a certain time if they contain water-free products.
- Recycled plastics sometimes are contaminated with substances that diffuse into the filling material which then may cause skin reactions when consumers use the product. The product specifications of the recyclates that often originate from China frequently list a lot of different components with sub-marginal thresholds however they may also contain additional chemicals that are not listed at all.

- Plastics are subject to electrostatic charge. They get dusty easily which should be kept in mind for the storage.

Elastomers (sealing gaskets)

- Sealing gaskets can soak or shrink, depending on their material properties and the filling material. Hence, just as for the containers, a compatibility check is required – particularly in presence of low molecular organic substances.
- The use of natural rubber may involve allergenic reactions (latex allergy).

Glass

- Inexpensive soda lime glass may release sodium ions into aqueous media and, depending on the buffering capacity of the filling material, increase the pH level.
- Glass and ceramic containers are advantageous insofar as they are absolutely impermeable for gaseous substances like oxygen and water vapour. Synthetic materials, by contrast, usually are permeable to some extent. The diffusion occurs in both directions and depends on the respective gradient. Oxygen-sensitive products that are filled under protective gas atmosphere hence are packed in glass containers.
- When using pipette containers with rubber seals, it should be considered that liposomes or liquid nanoparticles that get onto the screw thread will work like perfect ball bearings. The compressed sealing gasket then is powerful enough to unscrew the closed container. The bottles may empty when stored in a horizontal position. A trick may help in this case though: the containers should be equipped with artificial “brakes” or, in other words, with protruding glass knobs.

Metal

- Although the steal springs in airless dispensers will not come in contact with the filling material they can corrode in a warm and damp atmosphere.
- The use of aluminium containers or aluminium tubes with non-resistant or damaged internal coating may lead to a chemical reaction between metal and acidic components of the filling material particularly in presence of complexing agents. Soluble aluminium compounds may form then.

Airless dispensers

There are different designs of airless dispensers:

- **Type 1:** At filling, the dispenser is equipped with a double bottom part. After the filling, the top section of the dispenser is attached and snapped in.
  The interior double bottom is then traced upwards due to the vacuum generated by the dispenser top with each use. Characteristic for this type of dispenser is a tiny opening in the dispenser bottom which allows the air to fill in when the interior part moves upwards.
- **Type 2:** Before filling, the dispenser top is tightly connected with the bottom part that is open at the back. The bottom part is now filled from the rear side with a sliding disk applied on the filling material. After the surplus air escaped via an opening in the sliding disk, this opening is tightly sealed with a plastic nipple. The dispenser bottom part is then equipped with an even bottom panel. Now, the dispenser is ready for use. If the bottom panel is then removed with the product use, the upward movement of the sliding disk can be observed.

Time and again there are new technologies with regard to the internal mechanical system but also concerning the design of the different dispenser parts. Hence, the dispenser head can be designed like a plate with a central opening to dispense the content. By pressing the plate, the product is dispensed onto a fleece without touching the material. Said system can be combined with a wall mount for hygienic formulations (“moist tissues”, baby care) and fleece masks for the use in the beauty institute and is particularly recommended for preservative free products.

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