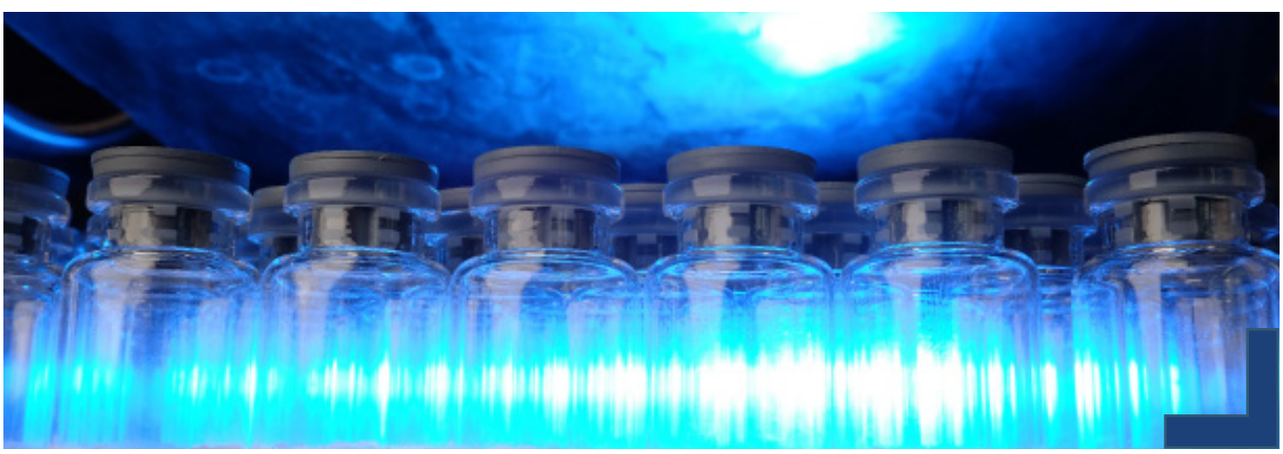
Life in focus.

WHAT IS FREEZE-DRYING?

Lyophilization, or freeze-drying, is a process in which water (or solvent) is removed from a product after it has been frozen and placed under vacuum. This allows the ice to directly convert from solid to gas (vapor) without passing through a liquid phase, a transition known as sublimation. The process of freeze-drying consists of three separate, unique, and independent steps: freezing, primary drying, and secondary drying (desorption).



THE ADVANTAGES OF FREEZE-DRYING

- Improved product stability and shelf life in the dry form, often storable at room temperature.
- Gentle drying without the addition of extensive heat that can damage the product.
- Quick and easy reconstitution back to the original form.
- Low moisture content in the final dried product (<1% is possible).

COMMON APPLICATION AREAS

This includes diagnostics, biopharmaceuticals, vaccines, bacteriology, organic chemistry, analytical chemistry, food, dietary supplements, environmental studies, archaeology, nanotechnology and forensic medicine

EVAPORATION AND FREEZE-DRYING

Combine evaporation and freeze-drying processes with Martin Christs vacuum centrifuge and Alpha freeze-dryer systems. With this workflow, you can choose to either freeze-dry, evaporate, or combine a process that starts with evaporation and ends with freeze-drying.

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With over 75 years of experience, Martin Christ GmbH is a world leader in the development and production of freeze-dryers.

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WHAT IS FREEZE-DRYING?

MOST COMMON WAY OF FREZE-DRYING

DRYING IN ROUND-BOTTOMED glass flasks, filter flasks and ampoules outside of the ice condenser chamber. The product is initially frozen in a separate freezer or cold bath before being connected to the freeze-dryer via a rubber valve. Each container can be attached and detached individually. For increased efficiency, batch-freezing flasks in a cold bath is recommended. Filter flasks are particularly useful when there is a risk of cross-contamination, as they help minimize product loss.

Suitable freeze-dryers for this process include these models:
Alpha 1-4 LSC basic
Beta 1-8/2-8 LSC basic
Delta 2-24 LSCplus

DRYING IN TRAYS, VIALS OR similar containers on either heated or unheated shelves outside the ice condenser chamber. Initially, the product is frozen in a separate freezer or cold bath before being dried in an acrylic or steel chamber. This process is performed in batches. When dealing with smaller volumes in vials or microtubes, a thermal block may be necessary to prevent thawing during handling.

Suitable freeze-dryers for this process include these models:
Alpha 2-4 LSCplus
Beta 2-8 LSCplus
Gamma 2-16 LSCplus

FREEZING AND DRYING in product trays, vials or similar containers inside the condenser chamber. This method allows the entire freeze-drying process to be fully automated within the freeze-dryer, eliminating the need for additional product handling. It is recommended for expensive and/or sensitive products with low freezing points (below -25°C) that are prone to melting. However, this approach offers less capacity compared to other methods.

Suitable freeze-dryers for this process include:
Alpha 2-4 LSCplus
Gamma 2-16 LSCplus
Delta 2-24 LSCplus

FREEZING AND DRYING IN product trays, vials, or similar containers on cooled and heated shelves. This process is fully automated, eliminating the need for manual handling of products. Freezing is achieved through direct contact with a cooled shelf. This method is standard for production and pilot systems used in production, process development, and optimization, particularly in the pharmaceutical and diagnostics industries.

Suitable freeze-dryers for this process include:
pilot freeze-dryers
production freeze-dryers.

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