



Improved Freeze Drying Method

Scientists at Aston University have developed a new improved method for the freeze drying (lyophilisation) of pharmaceuticals and other materials. The process uses existing freeze drying machinery and has the benefits of both increased amounts of material that can be dried per cycle and also a reduced overall drying time, generating significant cost savings.

Highlights

- Speeds the freeze drying process significantly
- Allows larger batch size, by increasing acceptable vial fill depths
- Benefit from increased throughput using existing freeze drying infrastructure.
- Quick reformulation of existing products.
- Applicable to all existing and new freeze dried pharmaceuticals
- Potential to generate significant cost savings

Background

The process of freeze drying in order to dehydrate a product is well known. In a typical freeze drying apparatus, the product to be dried is placed into individual containers and loaded onto trays that are inserted into the freeze drier. Such equipment has a high capital cost, limited space and is expensive to run.

The speed of drying is dependent on the surface area to volume ratio of the material to be dried. Existing methods of increasing the volume of material (such as increasing the amount of material in each container) have tended to increase the drying time as the surface area to volume ratio is reduced. Conversely methods of increasing the speed of drying (such as using containers that are large in area and low in height so increasing the surface area

to volume ratio) have reduced the number of containers that can be accommodated in the freeze drier and so have reduced the volume of material that can be dried in each batch.

There is therefore a need for new methods and apparatus that can increase the volume of product that can be dried in each run and also increase the speed of drying.

The Technology

Scientists at Aston have developed an improved method of freeze drying which is compatible with existing freeze drying equipment but allows the volume of material to be dried in each run to be increased while also reducing the drying time.

The primary freeze drying of formulations has been shown to be rate limited by the dry phase resistance to vapour flow setting a requirement for low product fill depths. By creating a second drying surface within the freeze drying vial the surface area of conventional formulations can be increased. As formulations dry on more than one surface they dry quicker and so higher fill volumes can actually be beneficial.

Typically vials are filled with a secondary solvent volume which is frozen with a defined orientation. This secondary solvent can be removed at high speed during the initial stage of drying. Its removal creates a significantly increased sublimation area for the formulation phase accelerating the overall drying rate. As a result, vial size can be reduced for almost all formulations maximising available shelf area and increasing throughput. Existing formulation characteristics including collapse temperatures (T_c) glass transition temperatures (T_g) or eutectic points are not altered, meaning that in most cases existing freeze drying cycles can be used and can often be further reduced in total length.

The system was originally developed for drying pharmaceuticals in vials or ampoules, but may also be applicable to food production or historical preservation.

Intellectual Property Protection

This technology is the subject of a UK priority patent application:

<i>Title</i>	<i>Pending Applications</i>	<i>Priority Claimed</i>	<i>Our Ref</i>
Improved methods and apparatus for freeze drying	GB 0909301.4	May 29, 2009	PAT-2009-014

Further Information

Further information can be made available and commercial discussions commenced on entering into a non-disclosure agreement.

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