

Superior granules by

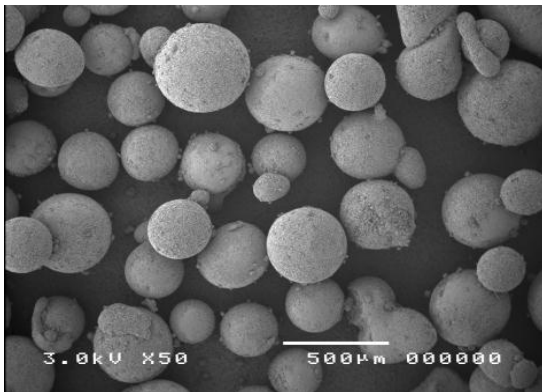
## Freeze Granulation

PowderPro AB provides equipment and know-how for granulation of powders or other material substances based on instant freezing of sprayed suspension drops and subsequent freeze-drying. This technology ensures high-quality granules with homogeneous distribution of all present material constituents. Freeze granulation can be applied as a potent preparation tool for a variety of materials/applications such as ceramics, powder metallurgy, processing of nanomaterials, diamond tools, battery materials, pharmaceuticals, biomaterials, catalytic materials, material synthesis etc.



### Granule homogeneity

Migration of the constituents that is common in other granulating processes such as spray drying is avoided in freeze granulation. By instant freezing of small droplets critical ice crystal growth is avoided. The freeze drying where the liquid medium is sublimated ensures homogeneity preservation, limited oxidation and soft bonds within the granules. This provides the best possible condition for any subsequent processing such as easy pressing to homogenous compacts, easy re-dispersing in a liquid, sintering of catalytic particles, dosage processes etc.



*Granules of composite material*

**Complete homogeneity in each granule guarantees optimal micro-structure in densified body**

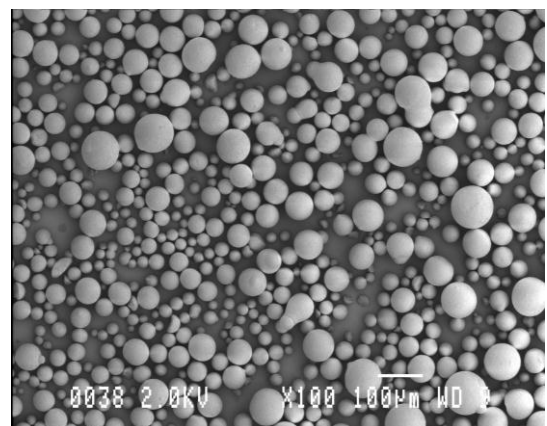
### Granule shape, size and density

Freeze granulation provides spherical free-flowing granules without cavities in the size range of 20-500 µm. The solids content of the suspension (slip) and the processing parameters (pump speed and airflow) control the granule density and granule size.

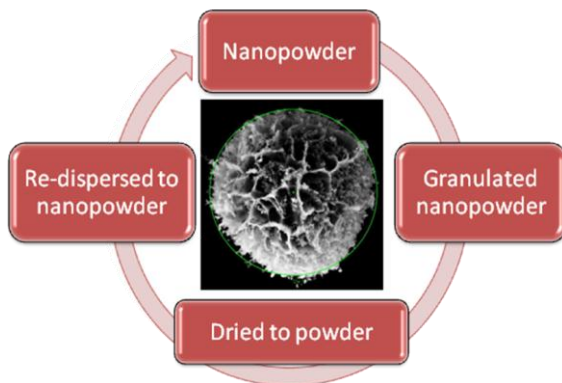
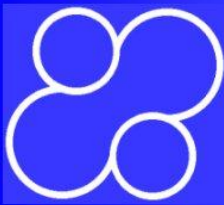
### Utilization

Freeze granulation can be utilized on lab scale as well on production scale with equality in granule properties and high yield.

Besides large quantities also very small experimental batches (50-100 ml slip) can easily be processed. The equipment is easy to clean, enabling use of water insoluble polymers (latexes) as binder and running of several different batches during one day. Water is the preferred liquid medium but it is also possible to use and recycle organic solvents (freeze point > -25°C).



*Granules of submicron ceramic powder*



## Processing of nano powders

Freeze granulation gives the possibility to granulate *nano powders* achieving granules with high degree of homogeneity which are easily re-dispersed (if applicable) in a liquid or dis-integrated at a pressing operation. This is owing to the weak inter-particle bonding compare to what is obtained in conventional drying. Consequently, the nanosized material properties will be preserved, i.e. nano will still be nano. Freeze-drying also prevents oxidation of metals or non-oxide materials as conventional drying do not, especially critical for nano powders.

## Technical Information

PowderPro AB provides equipment for freeze granulation in two versions, **LS-2** (see photo) and **LS-6**. The maximum granulation capacity of LS-2 is 2 litres slurry per hour and for LS-6 6 litres slurry per hours that typically correspond to ca 2 and 6 kg dry powder respectively.



**LS-2**

**LS-2** and **LS-6** consists of a slip container with a stirrer, a pump for the slip, a spray nozzle, a regulator for compressed air and an insulated chamber for spraying and granule collection.

Besides the granulator, a freeze dryer with sufficient capacity is required and can be provided.

Technical transfer including set-up of equipment and training of personnel is recommended and offered upon request.

PowderPro provides test granulations to reduced cost to evaluate the performance regarding your specific material system and application.

When purchasing of granulation equipment, PowderPro provides help in concepts for suspension formulation/preparation and how to operate the equipment to achieve high yield and high-quality granules.

**Freeze granulation** is considered to be a natural tool in most kind of material processing and development where optimal material performance is to be reached.

### Contact for more information

PowderPro AB  
Barken Storegrundsg. 1  
SE-417 60 Göteborg  
SWEDEN

Phone: +46-730-79 42 83  
Fax: +46-31-82 70 35  
E-mail: [sales@powderpro.se](mailto:sales@powderpro.se)  
Web site: [www.powderpro.se](http://www.powderpro.se)