

Microgravity-enabled drug products for patients on Earth

Varda's revolutionary work in microgravity environments enables the creation of drug products with enhanced benefits for patients on Earth. By harnessing the unique conditions of space, we optimize crystallization processes to improve drug formulation and delivery.

Biologics

- Intravenous to subcutaneous through high-concentration formulations
- Improved subcutaneous (lower dose volumes, faster injection, less frequent dosing)
- Formulations for challenging routes of administration
- Purification through crystallization
- Crystal structure determination

Small Molecules

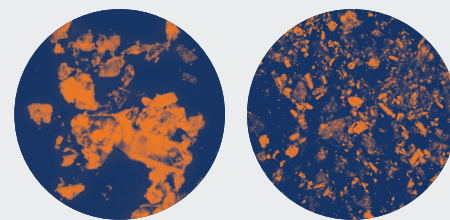
- Enable improved particle size for improved bioavailability, enabling Route of Administration changes (oral-inhalable) and more
- Overcome drug-substance development challenges related to crystallization (polymorph, particle size)
- Expand intellectual property portfolio – novel forms, improved process control in microgravity
- Difficult to crystallize compounds
- Purification through crystallization

Why Microgravity (and what is Hypergravity)?

Processing in a microgravity environment in space reduces buoyancy, natural convection, and sedimentation. When these variables are eliminated, diffusion-driven transport phenomena dominate leading to altered crystallization conditions that can enable controllable/uniform particle size, more ordered crystals, and changes in polymorphic outcomes.

On Earth, it is impossible to decrease gravity, but we can increase it by using our Hypergravity Platform in our terrestrial lab. Under hypergravity conditions, convection-driven phenomena dominate which leads to accelerated mass transport and crystal growth rates. This process can be used to determine if crystallization outcomes are sensitive to gravitational forces before launch.

How does gravity impact crystallization?



On Earth

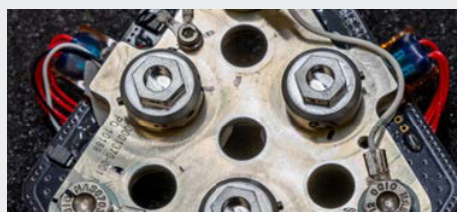
In Space

Microgravity suppresses convective currents and sedimentation, leading to more uniform crystals.

Highlights

Ritonavir Form III and the W-1 Mission

We can isolate amorphous and less stable forms and ensure that what we make in space is what comes back. Read [here](#) and [here](#).



 Improved Pharma

Modeling Polymorphic Outcomes with SSPC

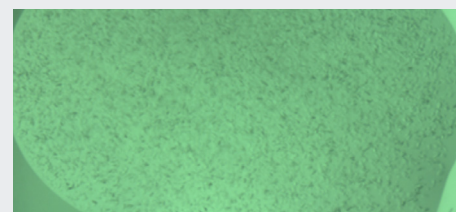
We show how novel math reveals gravity's influence on polymorphs. Read [here](#).



 SSPC

Building on foundational research on the ISS

We've crystallized 12 monoclonal antibodies, with 6 more scaling this year. Read [here](#).



 VARDA SPACE INDUSTRIES

Working with Varda

About Varda

At Varda, we lead the frontier of process engineering, specializing in drug substance development through pioneering techniques in hypergravity, gravity, and microgravity.

Our team, composed of experts in chemical engineering, chemistry, physics, biologics, crystallization, and aerospace engineering, identifies and mitigates risks in drug substance development and crystallization.

Our integrated, multidisciplinary approach fosters seamless collaboration between chemists and engineers, ensuring efficient risk assessment, de-risking strategy development, and scale-up support.

Our Services

We provide comprehensive scientific services that cover all aspects of process experimentation under various gravitational conditions. Whether you're developing or de-risking a chemical reaction, a crystallization, or troubleshooting batch-to-batch variability, our tailored solutions ensure process robustness and quality.

Earth Capabilities

Biologics

Formulation development, high-throughput crystallization screening, and advanced analytics.

Small Molecule

Crystallization process development, solvent screening, and comprehensive analytics.

Space Capabilities

Crystallization

Solution-based and melt/cool crystallization methods.

Process Transfer & Validation

Extensive validation and qualification ahead of flight.



Technology Platforms



In-house process equipment design, development and testing



Hypergravity



Spacecraft (Capsule & Bus)

