Varda Announces Collaboration with SSPC to Improve Fundamental Understanding of Microgravity Crystallization

Advances in mathematical models can illustrate the benefits of microgravity on drug performance and patient experience on Earth.

LIMERICK, IRELAND, September 11, 2024 /EINPresswire.com/ -- Varda Space Industries, Inc., the world's first in-space pharmaceutical processing and hypersonic Earth re-entry logistics company, together with the SSPC Centre funded by Taighde Éireann – Research Ireland, today announced a research collaboration that aims to advance mathematical modelling of crystallization in microgravity, the first such framework that considers polymorphism.

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> *Adrian Radocea, Chief Science Officer, Varda Space Industries*

A molecule can exist in multiple crystal forms; each different crystal form is known as a polymorph. The crystal structure contributes various characteristics to the molecule, so polymorphs of the same molecule can have very different properties, such as their melting point, hardness, and solubility. Understanding and controlling polymorphism is essential for manufacturing pharmaceuticals, and this partnership between Varda and SSPC will serve to further analyze and predict the impact of gravity on crystallization.

Varda and SSPC researchers based at the University of Limerick and Mathematics Applications Consortium for Science and Industry (MACSI), Ireland, are collaborating on research that focuses on developing mathematical models for a better understanding of how gravity influences crystallization and the resulting polymorphic outcomes.

"While the behavior of fluids in microgravity is well understood, the link between fluid motion and crystallization outcomes—especially with respect to changes in the resulting crystal structure—has never been previously addressed," said Varda Chief Science Officer Adrian Radocea. "Our research collaboration with the SSPC lays the foundation for directly understanding polymorphic outcomes from first principles, taking into account molecule-specific parameters, as well as the thermodynamics and kinetics that underpin crystallization."

The mathematical model to be developed will be widely applied to understand the role of gravity in crystallization of small molecules both in space and on Earth, uncovering aspects of process development that are little studied today. The model will ultimately be supporting the expansion of the pharmaceutical industry into low Earth orbit by using the benefits of microgravity to improve drug performance and patient experience here on Earth.

According to Professor of Applied Mathematics, Michael Vynnycky, “Rigorous mathematical modelling allows us to take maximum advantage of experiments conducted in this unique environment. Combining our model with experimental validation paves the way for groundbreaking approaches to utilise microgravity to improve crystallisation of pharmaceuticals and other materials.”

Prof. Damien Thompson, SSPC Director, added, “We are always pushing forward as a centre, exploring new ways of creating materials through modelling-guided experimentation with our wide range of research partners worldwide. In this exciting collaboration with Varda Space Industries, we are developing, validating and applying new mathematical modelling tools that we hope will lead to inventive discoveries and innovative applications of pharmaceutical crystals grown in microgravity. Having world-class expertise at SSPC in predictive modelling has enabled us to build this exciting collaboration with Varda that takes us literally ‘out of this world.’ The insights gained from this research have the potential to transform the way we approach challenges in the realms of materials and pharmaceuticals.”

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