



IFPRI BRIEF TEMPLATE

Check One: **Project** **Review** **Collaboration**
 Workshop **Other**

Descriptive Title	Modelling of porous structure developed from supersaturated solutions during drying
Working Title¹	Modelling of porous structure formation during drying
Technical Area²	Particle Formation
Date	June 14 th 2022
Short Description	<p>Formation of a porous particles during drying is of great importance for industrial partners, as it would impact not only final powder properties (e.g. reconstitution, density), but also drying kinetics and efficiency (improving process sustainability).</p> <p>To create such internal porous structure, gas dissolution in concentrated solutions or slurries is generally applied prior drying to achieve saturated state. Then, during the drying process, because of supersaturation state, gas nucleation and growth is happening, leading to porous particles. However, both processes of drying (inducing viscosity build-up gradient) and formation of bubble (nucleation, growth, coalescence) occurs at the same time with different kinetics which could lead to very different internal pore structure (size and distribution).</p> <p>It would be very beneficial to be able to model these two combined processes in order to correlate liquid properties and process conditions (model input) to the final porous structure such as pore size and distribution (model output).</p>
Objectives	<p>The objectives of this project are:</p> <ul style="list-style-type: none"> • To develop a model that will enable to predict the porous structure of dried particle (e.g. pore size distribution), considering the initial concentrate or slurry properties (e.g. solution composition, viscosity, surface tension, gas used, level of saturation, presence of insoluble fraction), as well as the drying conditions (e.g. temperature, kinetics)

¹ Title used in meeting agendas and file archives

² One or more from the following list: W = wet systems; D = dry systems; F = particle formation; SR = size reduction; M = modeling; SE = systems engineering

	<ul style="list-style-type: none"> To validate this predictive tool, with lab or pilot scale experiments. Some relevant data could be provided by industrial partners involved.
Scope	<p><u>Material</u>: Concentrated solution or suspension with various compositions, viscosity and surface tension properties (Industrial partners can provide guidance)</p> <p><u>Gas</u>: CO₂ or N₂, saturated at various pressure</p> <p><u>Process</u>: Should cover various drying processes' timescale from seconds to hours e.g. Spray-drying, extrusion, oven drying.</p> <p><u>Out of scope</u>: vacuole formation during high temperature drying process due to water vaporization.</p>

Recommended Contractors (2 or 3)		
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List to be reviewed		

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