



## IFPRI BRIEF TEMPLATE

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

<b>Descriptive Title</b>	Spraying of highly concentrated materials and its impact on drying kinetics and resulting powder functionalities
<b>Working Title<sup>1</sup></b>	Spray-drying of paste to improve sustainability
<b>Technical Area<sup>2</sup></b>	F (Particle Formation)
<b>Date</b>	06/18/2021
<b>Short Description</b>	Spray-drying of liquid products is a key technology that is widely used in many industries. Its impact on environment could be reduced by increasing the concentration of liquid to be dried, and therefore reduce the quantity of water that need to be extracted during spray-drying. The current limitations to achieve it are the ability to atomize highly viscous liquid (formation of small droplets), and then to achieve short drying time required in spray-drying process while not sticking on the dryer surfaces. On top, providing that such paste spray-drying would be achieved, functionalities of final powders such as reconstitution should also be maintained.
<b>Objectives</b>	<p>The aim of this project will be:</p> <ol style="list-style-type: none"> <li>1- Identify and validate atomization technology that will enable spraying highly viscous materials (up to 100 Pa.s) and generate droplet size below 100 <math>\mu\text{m}</math> [see references below]</li> <li>2- Develop method to measure drying kinetics of such highly viscous droplet in controlled temperature and humidity conditions, and develop diffusivity-based model to predict drying kinetics, e.g. (but not limited to) in advanced single droplet drying set-up</li> <li>3- Evaluate impact of material composition (e.g. molecular weight, slurry with insoluble particles) and both droplet and surface properties (e.g. size, shape, surface internal porosity, average composition and surface composition) on drying kinetics.</li> </ol>
<b>Scope</b>	<p>Aqueous systems such as water soluble or dispersions (materials can be provided by industrial IFPRI members if necessary)</p> <p>Focus should be on paste and high viscous materials, not necessarily shear-</p>

<sup>1</sup> Title used in meeting agendas and file archives

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

<b>Some references</b>	<ol style="list-style-type: none"> <li>1. Stähle, P., et al. (2017). "Comparison of an Effervescent Nozzle and a Proposed Air-Core-Liquid-Ring (ACLR) Nozzle for Atomization of Viscous Food Liquids at Low Air Consumption." <i>Journal of Food Process Engineering</i> 40(1)</li> <li>2. García, J. A., et al. (2016). "Experimental characterization of the viscous liquid sprays generated by a Venturi-vortex atomizer." <i>Chemical Engineering and Processing - Process Intensification</i> 105: 117-124</li> <li>3. Czisch, C. and U. Fritsching (2008). "Atomizer design for viscous-melt atomization." <i>Materials Science &amp; Engineering A</i> 477(1-2): 21-25</li> </ol>
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<b>Recommended Contractors (2 or 3)</b>		
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