



**IFPRI**

**International Fine Particle  
Research Institute**

# Particle Formation Consultants Report 2021

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Karen Hapgood

Deakin University, Geelong, Australia

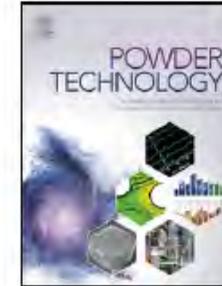


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Contents lists available at ScienceDirect

# Powder Technology

journal homepage: [www.elsevier.com/locate/powtec](http://www.elsevier.com/locate/powtec)



## Experimental investigation of wet pharmaceutical granulation in-situ synchrotron X-ray imaging

Chen Li<sup>a</sup>, Yuzhou Zhang<sup>a</sup>, Ning Zhu<sup>a,b</sup>, Heather N. Emady<sup>c</sup>, Lifeng Zhang<sup>a,\*</sup>

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<sup>c</sup> School for Engineering of Matter, Transport and Energy, Arizona State University, AZ, USA



#WomenInChemE

Congratulations

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EMADY**

**FOR YOUR NSF CAREER AWARD!**

#1846858

QUANTIFICATION OF THE POWDER-  
LIQUID INTERFACE VIA MULTI-SCALE  
GRANULATION

**AIChE WIC  
2019**



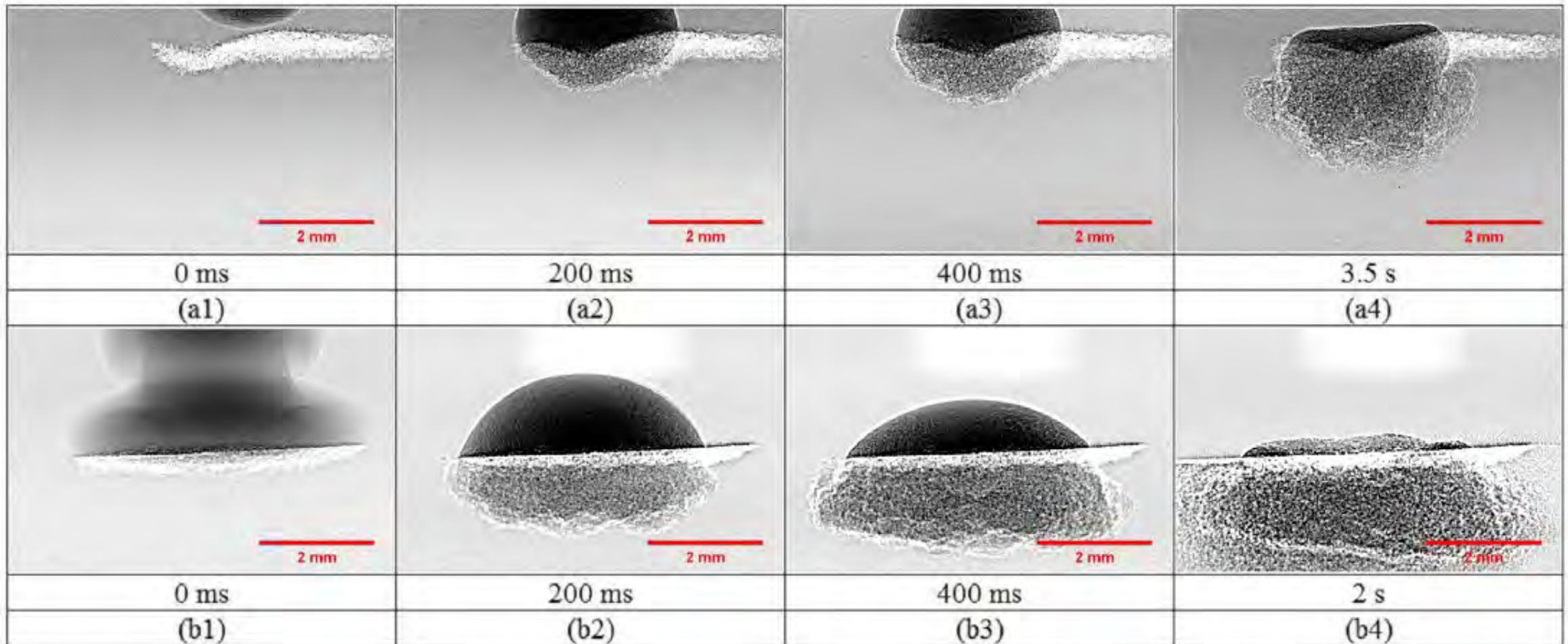


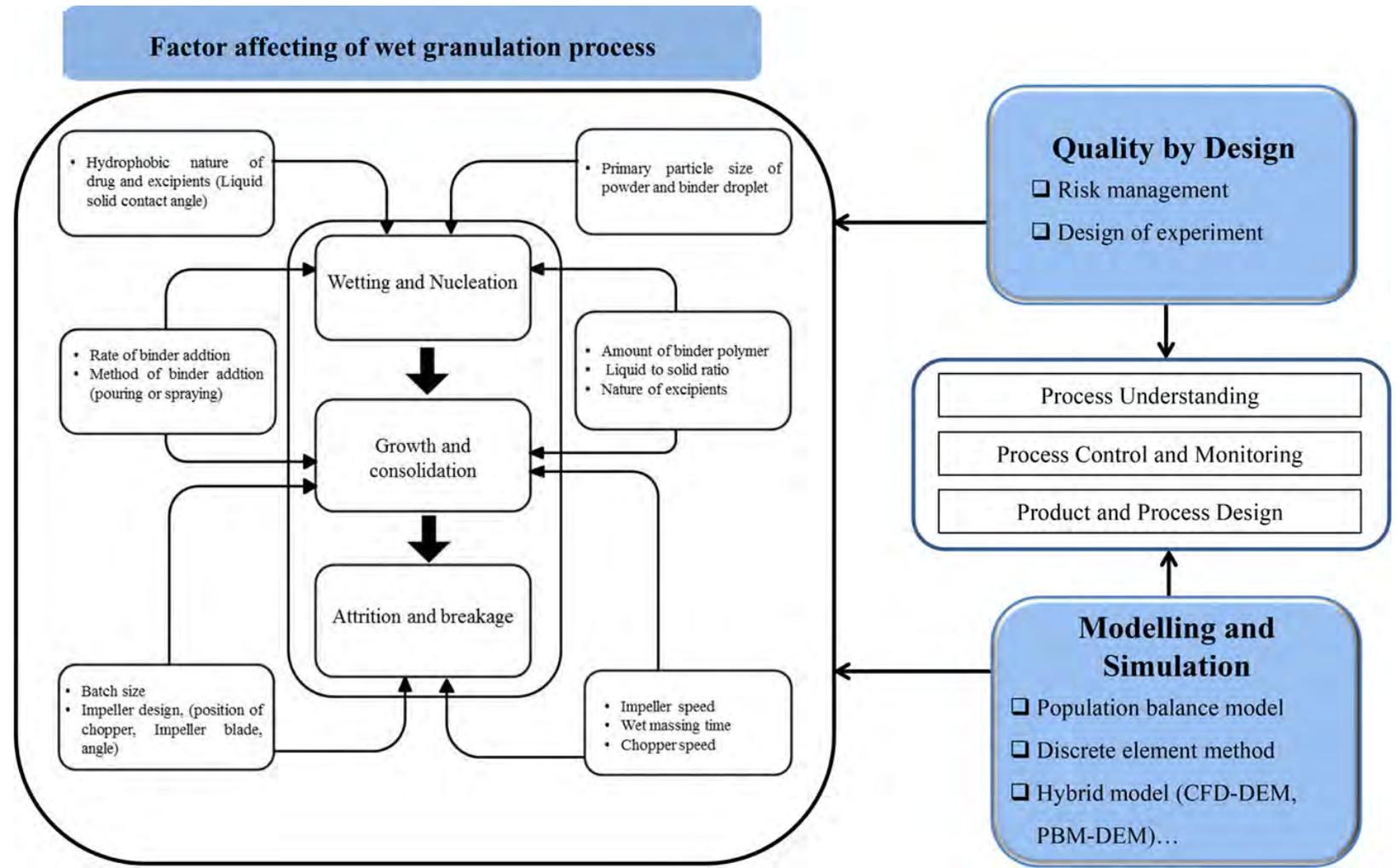
Fig. 10. The time sequence X-ray images of the granulation process of LMH powder with water as a liquid binder released from 2.5 cm at volumes of (a1-a4) 10  $\mu$ l and (b1-b4) 15  $\mu$ l [18].

# Recent\* Review Papers – Pharma Wet Granulation

Thapa, P., Tripathi, J., & Jeong, S. H. (2019). Recent trends and future perspective of pharmaceutical wet granulation for better process understanding and product development. *Powder Technology*, 344, 864-882. doi: <https://doi.org/10.1016/j.powtec.2018.12.080>



Seoul, Korea

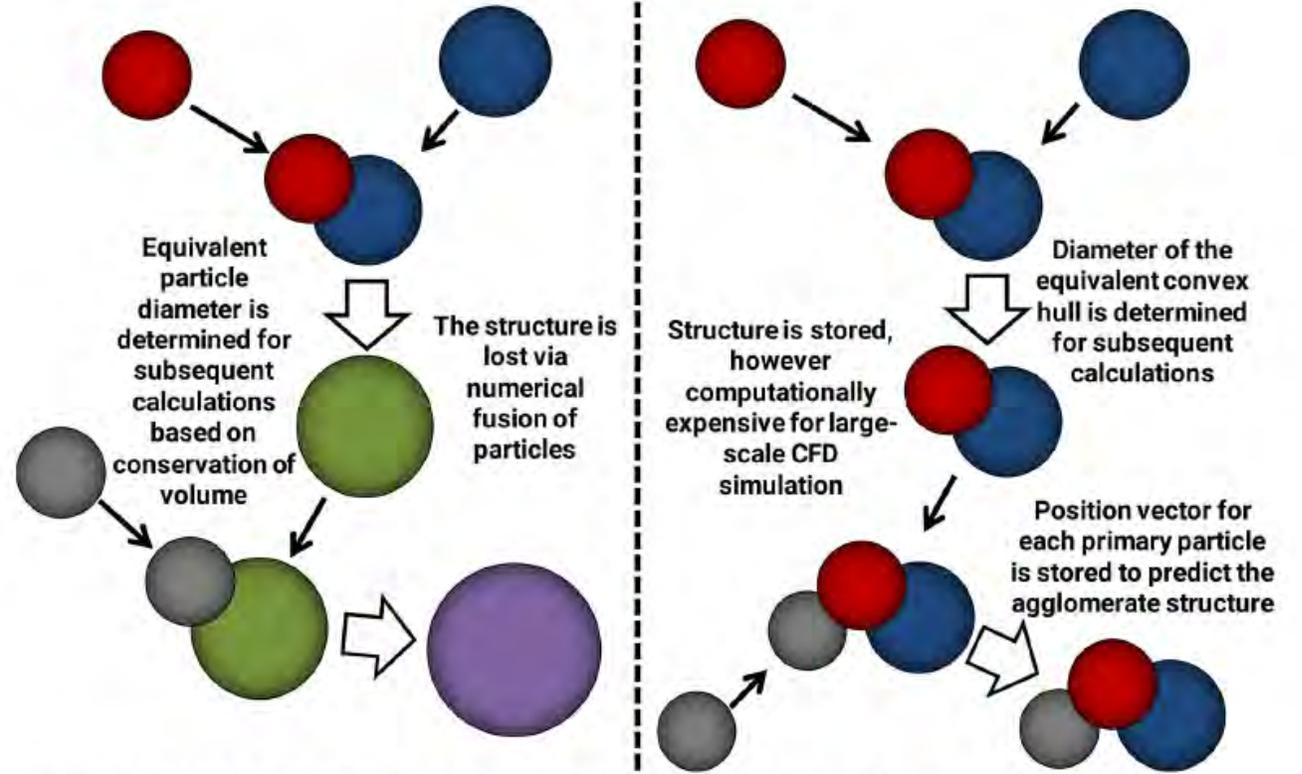


# Recent\* Review Papers – Modelling Spray Drying

Razmi, R., Jubaer, H., Krempski-Smejda, M., Jaskulski, M., Xiao, J., Chen, X. D., & Woo, M. W. (2021). Recent initiatives in effective modeling of spray drying. *Drying Technology*, 1-35. doi: 10.1080/07373937.2021.1902344



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EDECAD Project: R. E. M. Verdurmen et al. (2004), *Drying Technology*, 22(6), pp. 1403-1461.

Sommerfeld Group: Sommerfeld, M., & Stübing, S. (2017). *Powder Technology*, 319, pp. 34-52.



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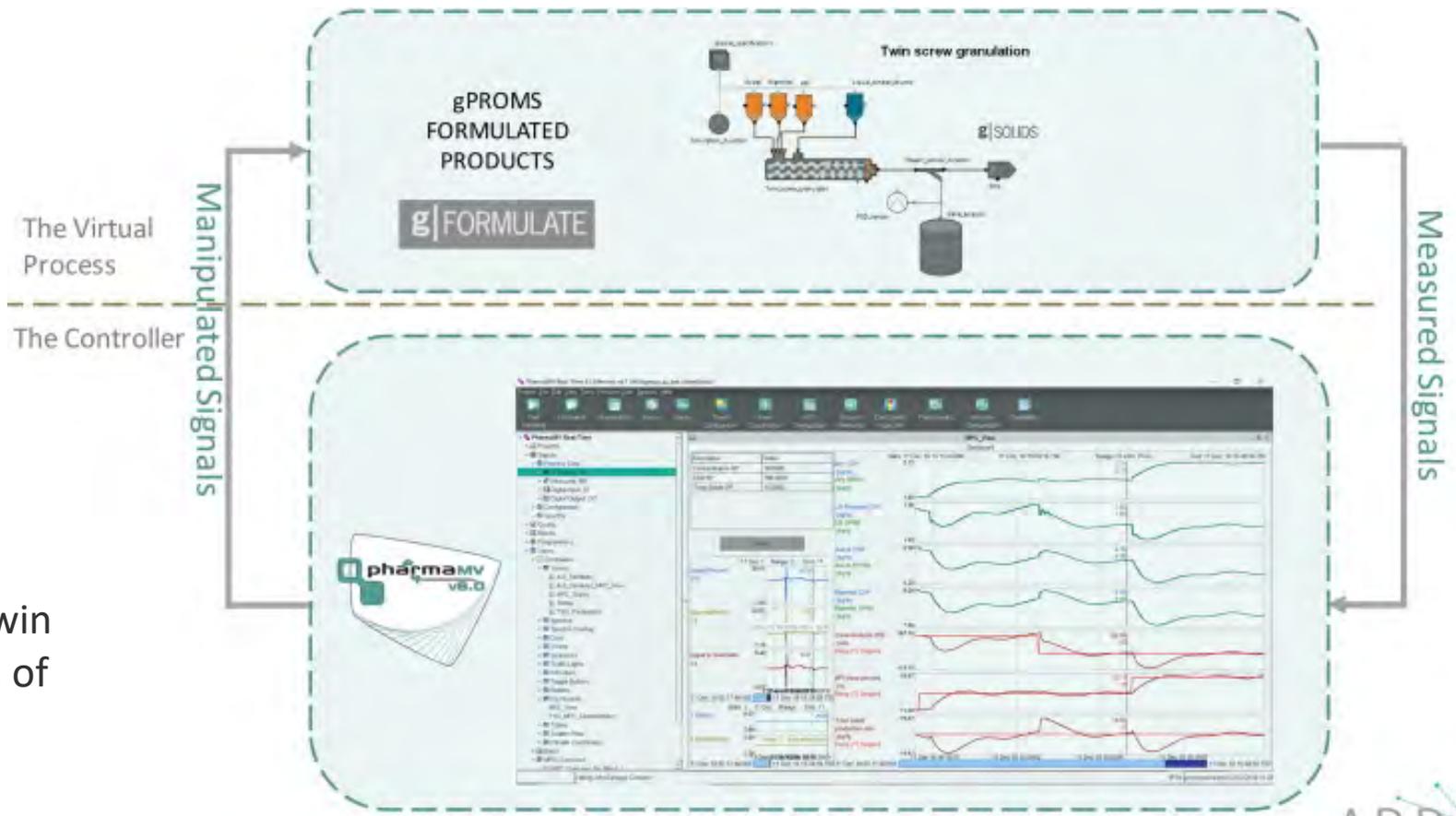
Thanks to Arno Kwade for highlighting this paper

# Review – Flowsheet process modelling

Dosta, M., Litster, J. D., & Heinrich, S. (2020). Flowsheet simulation of solids processes: Current status and future trends. *Advanced Powder Technology*, 31(3), 947-953. doi: <https://doi.org/10.1016/j.apt.2019.12.015>

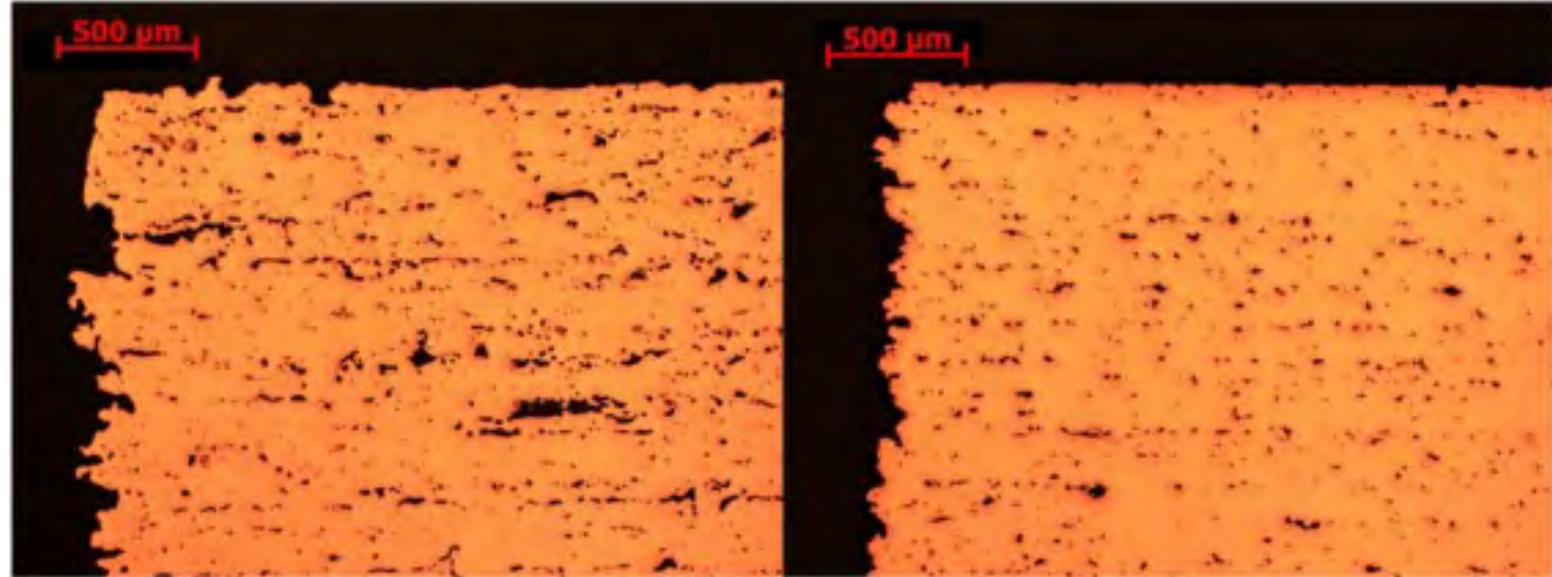


Using a process simulation digital twin gPROMS for twin screw granulation of pharmaceuticals to tune a model predictive controller (PharmaMV)



# Recent\* Review Papers – Binder Jetting 3D Printing

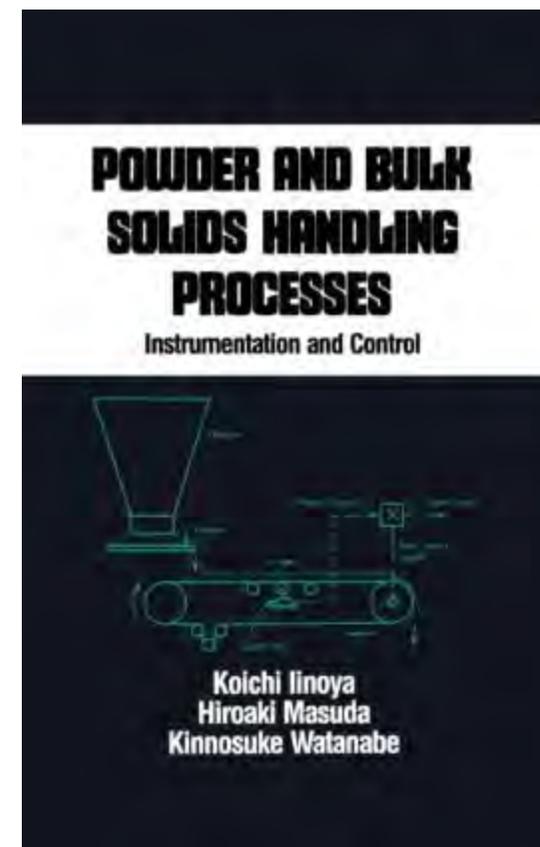
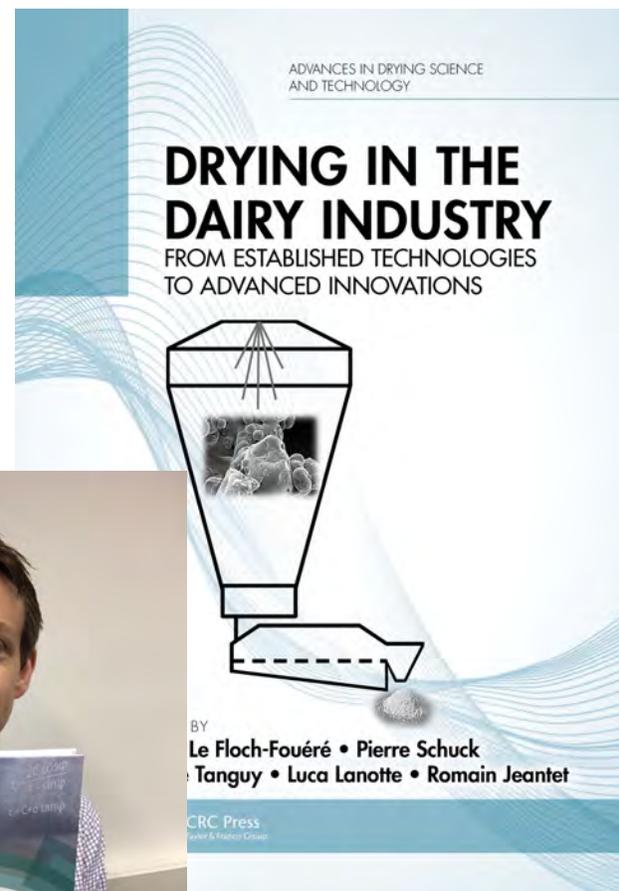
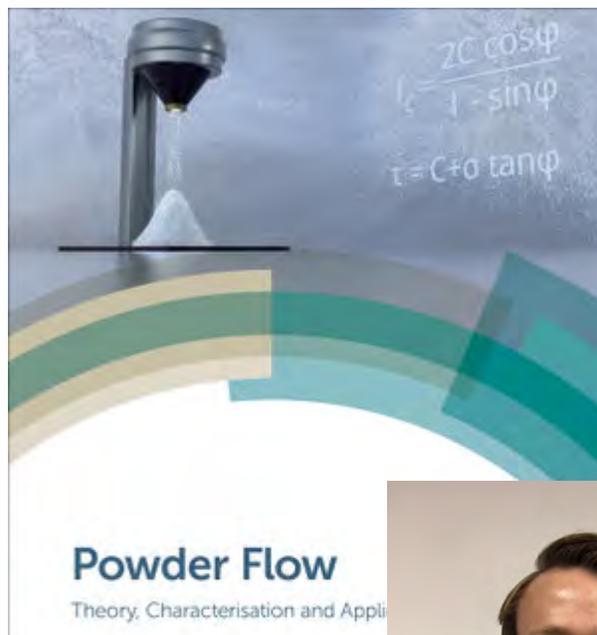
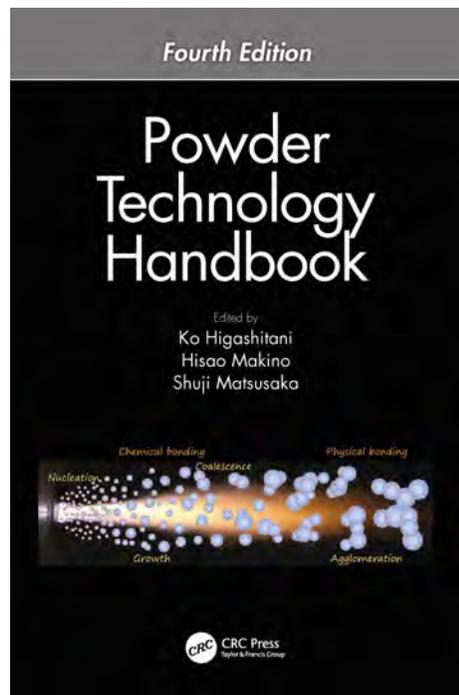
Ziaee, M., & Crane, N. B. (2019). Binder jetting: A review of process, materials, and methods. *Additive Manufacturing*, 28, 781-801. doi: <https://doi.org/10.1016/j.addma.2019.05.031>



(a) monosized 5  $\mu\text{m}$  copper powder      (b) bimodal copper powder of 30  $\mu\text{m}$   
Showing tendency for pores to accumulate along the layer boundaries (73 Vol.%)



# Recent\* Book Publications



# Recent\* Review Papers – Mining on the Moon

Rasera, J. N., Cilliers, J. J., Lamamy, J. A., & Hadler, K. (2020). The beneficiation of lunar regolith for space resource utilisation: A review. *Planetary and Space Science*, 186, 104879. doi: <https://doi.org/10.1016/j.pss.2020.104879>



Imperial College  
London

*Lectureship in Mineral Processing*



# From Froth Flotation on Earth to Electrostatic Beneficiation on the Moon

The route towards dry mineral processing

<https://www.youtube.com/watch?v=0OrAhI0zH1E&t=111s>

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ESA/Foster+Partners