A Smart Drying Approach for the Dairy Industry

The food and dairy sector is a significant contributor to the social and economic prosperity of the Australasia region, and is poised to overtake mining as the largest export industry in the near future. The Australian dairy industry alone annually contributes almost $3 billion in export earnings, with >20% export growth for a diverse range of dairy products (milk protein concentrates, yoghurt, casein, etc). Spray-dried products are the major category with > 400,000 MT of milk powders produced on average. To remain competitive in the global market, the Australian dairy manufacturers increasingly focus on products such as infant formula and specialised dairy ingredients. With the relaxing of its one-child policy, the demand for infant formula from China alone is expected to grow 10%-12% by 2020.

Spray drying is a multiphase process, with complex interactions between droplets, air, and particles of different flow trajectories and drying histories. With regular introduction of new dairy formulations, it is important to know how different processing parameters could affect product properties such as solubility and heat stability. Often costly trial and error approaches are used to determine spray-drying conditions that are far from optimum. The Monash group has developed a range of diagnostic tools for spray drying systems, including direct measurements of single droplets during drying to obtain material-specific drying kinetics, powder generation under well-defined drying conditions for functionality measurement, and dryer-wide modeling for typical spray dryers. This talk will present the technology platform to obtain quantitative information on drying kinetics and functional properties for a range of dairy powders (high solids / protein / fat, infant formula), using some examples of current collaboration with our industry partners.

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Brief Biography

Prof Selomulya is leading the Biotechnology and Food Engineering group with an internationally recognised reputation in drying technology research, and the only facility in Australia for functional particle assembly via microfluidic spray drying. The unique spray dryer can be used to synthesise other types of particles, including thermal sensitive and bioactive particles, microparticles for controlled release and microencapsulation, magnetic and fluorescent composites, and mesoporous microspheres with hierarchal structures and properties superior to those observed on nanomaterials (Prov. Patent AU2013904021). The method is scalable and is potentially a cost effective, energy and material-efficient route to produce high quality powders with better functionality and ease of handling. This technology is an integral part of her collaborations with Dairy Innovation Australia Ltd, French National Institute for Agricultural Research (INRA), Agrocampus Ouest (France), Dairy Management Inc. (US), South Dakota State University, several Chinese universities (Soochow, Xiamen, Fudan, Nanchang) and companies (Kingdomway Group, Guangzhou Ling Nan Intel Enterprise Group Co., Ltd, 3M, P&G, etc).

Her works with the dairy industry have been highlighted in Chemical Processing, Monash Magazine, and internationally (Science Daily, ABC International, etc). She is the director of the Australia-China Joint Research Centre for Future Dairy Manufacturing (2016 – 2019), a joint strategic initiative funded by the Australian and Chinese governments, and industry partners in both countries, including Bega, Devondale Murray Goulburn, Fonterra, Gardiner Foundation, Food Innovation Centre, COFCO, and Mengniu Dairy (http://acjrc.eng.monash.edu/). She is also the director of Graduate Industry Research Partnership (GRIP) for the Food and Dairy industry, launching in 2017 (https://www.monash.edu/fdgrip).