Topical Research Meeting on
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Session: Ingredients

Dispersing and dissolving food powders in a liquid: understanding the interplay of interfacial properties and liquid flow

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The reconstitution of liquid foods from dehydrated powders is a key step in both food manufacturing processes and the preparation of consumer beverage products. Lump formation upon reconstitution is a common issue in both scenarios.

This study aims at understanding the interplay between the interfacial properties of the powder grains and the characteristics of the liquid flow used to disperse them, in order to obtain an effective, uniform dispersion, avoiding air entrainment and lump formation. Insoluble grains have been used to reduce the complexity of the system. The dispersion of grains with sizes ranging between 50 and 1000 μm was investigated on both static and moving air-liquid interfaces.

It was found that powder grains disperse easily when the grain contact angle is below a critical value. Above the critical contact angle, a powder island (stack) forms and grows to a critical depth that depends on grain radius and contact angle. The experiments showed that the critical depth of a stack of grains on a static liquid increases with decreasing grain radius and increasing contact angle. Introducing flow in the liquid can either promote wicking or destabilise the whole stack. In this undesired scenario, the whole stack sinks, forming a heterogeneous powder structure that is wet outside and dry inside. This structure is reminiscent of the lumps that are often the undesired outcome when dispersing food powders.