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BARDS: A new dimension in food ingredient and powder analysis

Dara Fitzpatrick, Rizwan Ahmed and **Saskia Van Ruth**
University College Cork, Republic of Ireland

Statement of the Problem: Broadband acoustic resonance dissolution spectroscopy (BARDS) is a new tool for characterizing powders, blends and tablet formulations. Food powders, from salts to dairy products, represent a significant percentage of food ingredients and products. It is also a convenient stage at which to adulterate a product in the production chain. There have been many high profile examples in recent times, most notably with deliberate adulteration and contamination of infant food formulations in China. In this study BARDS will be shown to be an effective method of monitoring the quality/provenance of food grade powders and slats by establishing baseline data as a control against which comparator measurement can be made by a simple and rapid dissolution test.

Methodology & Theoretical Orientation: Figure 1 shows a BARDS instrument used for powder/sample testing. Sample is added from a weighing boat on an automated tipper. A magnetic stirrer is used to create resonant frequencies in the dissolution vessel by gently tapping the inner wall. The sample is added after 30 seconds which causes changes in the resonant frequencies which are intrinsic to the sample. The changes are caused by gas trapped between particles and within particles and also due to its reduction in gas solubility in the solution due to dissolution. This causes changes in the solubility of the solvent which reduces the speed of sound of the resonant frequencies. The frequency returns to steady state as the gas exits the solution.

Findings: Food powders produce acoustic signatures related to the constituents, physical properties and provenance of the powder.

Conclusion & Significance: BARDS acoustic profiles can be used as an indicator of the provenance of a powder sample upstream in quality control before more sophisticated techniques are required.

Recent Publications:

1. Principles and Applications of Broadband Acoustic Resonance Dissolution Spectroscopy (BARDS): A Sound Approach for the Analysis of Compounds. Anal. Chem. 2012, 84, 5, 2202-2210 http://refhub.elsevier.com/S0963-9969(18)30763-4/rf0080
2. New insights into the mechanism of rehydration of milk protein concentrate powders determined by Broadband Acoustic Resonance Dissolution Spectroscopy (BARDS):Food Hydrocolloids, 61, (2016), Pages 933-945 http://refhub.elsevier.com/S0963-9969(18)30763-4/rf0155
3. The sound of salts by Broadband Acoustic Resonance Dissolution: Food Research International. (2018) In press https://doi.org/10.1016/j.foodres.2018.09.044
4. Broadband Acoustic Resonance Dissolution Spectroscopy (BARDS):A Novel Approach To Investigate the Wettability of Pharmaceutical Powder Blends: Mol. Pharmaceutics (2018), 15, 1, 31-39.

Biography

Dara Fitzpatrick graduated with a Ph.D. from Trinity College Dublin and worked on an EU framework V postdoctoral research fellowship before taking up a lecturership in Analytical Chemistry at University College Cork. He is the originator of Broadband Acoustic Resonance Dissolution Spectroscopy and Director of a successful spin-out company that has commercialized his research. He has extensive collaborations with industry and the company has sold instruments to global multinationals such as GSK, Pfizer and Cargill to name a few. BARDS has developed into a platform technology with several applications, particularly in powder analysis.

d.fitzpatrick@ucc.ie