frontiers | Frontiers in Soft Matter

TYPE Editorial
PUBLISHED 14 April 2023
DOI 10.3389/frfsm.2023.1193657

OPEN ACCESS

EDITED AND REVIEWED BY
Thomas Hellweg,
Universität Bielefeld, Germany

*CORRESPONDENCE
Anne-Laure Fameau,
Anne-laure.fameau@inrae.fr
Eduardo Guzmán,
eduardogs@quim.ucm.es
Hernán A. Ritacco,
hernan.ritacco@uns.edu.ar
Arnaud Saint-Jalmes,
arnaud.saint-jalmes@univ-rennes.fr

RECEIVED 25 March 2023
ACCEPTED 03 April 2023
PUBLISHED 14 April 2023

CITATION
Fameau A-L, Guzmán E, Ritacco HA and Saint-Jalmes A (2023), Editorial: Liquid foams and emulsions stabilized by bio-based particles.
Front. Soft. Matter 3:1193657.
doi: 10.3389/frfsm.2023.1193657

Editorial: Liquid foams and emulsions stabilized by bio-based particles

Anne-Laure Fameau[1]*, Eduardo Guzmán[2,3]*, Hernán A. Ritacco[4]* and Arnaud Saint-Jalmes[5]*

[1]University Lille, CNRS, INRAE, ENSCL, UMET, Villeneuve d'Ascq, France, [2]Departamento de Química Física, Universidad Complutense de Madrid, Madrid, Spain, [3]Instituto Pluridisciplinar, Universidad Complutense de Madrid, Madrid, Spain, [4]Instituto de Física del Sur (IFISUR UNS-CONICET), Bahía Blanca, Argentina, [5]University Rennes, CNRS, IPR (Institut de Physique de Rennes)–UMR 6251, Rennes, France

KEYWORDS

foam, emulsion, protein, particle, interface

Editorial on the Research Topic
Liquid foams and emulsions stabilized by bio-based particles

Foams and emulsions are ubiquitous colloidal systems in daily life and technology. From a physico-chemical perspective, these appear as biphasic dispersions formed by the dispersion of a fluid (liquid or gas) as small droplets and bubbles in a continuous liquid medium. The result is the formation of thermodynamically metastable systems that over time tend to separate into their individual components (gas-liquid and liquid-liquid). Amphiphilic molecules are traditionally used to stabilize these systems and try to prevent or delay the destabilization mechanisms. Another type of stabilizer which can be used to stabilize foams and emulsions are partially hydrophobic colloidal particles. These particles are able to adsorb strongly at fluid-fluid (gas–liquid or liquid–liquid) interfaces to sterically hinder coarsening (ripening) and coalescence, as well as to slow down drainage (creaming) by changing the rheological properties of the continuous phase. These foam or emulsion systems are commonly referred as "Pickering" foam/emulsion. The seminal studies in this type of "Pickering-Ramsden" systems were focused on the exploitation of inorganic particles to provide stability to emulsions and foams. However, this type of particles present a limited relevance for practical applications due to toxicity, lack of biocompatibility and biodegradability. In the last decade, there has been a shift toward the development of foams and emulsions stabilized by bio-based particles. The goal of this Research Topic is to show the recent advances in the field of emulsion and foam stabilized by bio-based particles made of proteins (plant proteins and animal proteins). The focus of these articles is on the potential of existing or new protein particle systems as foam or emulsion stabilizers.

One of the contributions to these topic is a review article summarizing the recent findings and the open questions remaining about the interfacial properties of protein particles adsorbed at fluid/fluid interfaces, and the links between these interfacial properties and the stability of foams and emulsions (Fameau et al.).

There are two research articles focusing on the design and fabrication of protein particles/aggregates. Fameau et al. studied the production and the role of protein aggregates from β-casein on foam stability with temperature by using a multiscale approach. The presence of aggregates increases the foam stability, but they demonstrate that it is not possible to obtain thermoresponsive foams from these protein systems. Moraveji et al. present a strategy for producing gliadin nanoparticles by deamidation, and how the degree of deamidation has an effect on their air-water surface behavior. By combining characterization techniques at different scales, this study shows the potential of deamidation method to tune the gliadin particles properties.

There are two additional articles reporting fundamental research demonstrating the use of specific techniques to study the interfacial properties of proteins. Gräff et al. studied in depth how different milk proteins can contribute to the stabilization of foam films. They used spatially resolved disjoining pressure isotherms in a thin film pressure balance to explain the difference in film stability as function of the used proteins, evidencing that the structure of the protein network turns out to be the key parameter controlling the film stability. Velandia et al. demonstrate the interest of using fluorescence lifetime microscopy with molecular rotors as local probes to study interfacial viscosity of protein layers. By using this method to pea proteins stabilized emulsions, they show that the treatment of the pea protein isolates before emulsification is of a paramount importance to control the interfacial behavior and the emulsion stability.

In summary, the articles collected in this topic provide an insightful understanding in the use of proteins to design bio-based particles, and how such particles modify both interfacial properties and the stability of emulsions and foams.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.