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Editorial

Fluid Interfaces

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Received: 28 August 2020; Accepted: 24 September 2020; Published: 20 October 2020

Abstract: Fluid interfaces are promising candidates for the design of new functional materials by confining different types of materials, e.g., polymers, surfactants, colloids, or even small molecules, by direct spreading or self-assembly from solutions. The development of such materials requires a deep understanding of the physico-chemical bases underlying the formation of layers at fluid interfaces, as well as the characterization of the structures and properties of such layers. This is of particular importance, because the constraints associated with the assembly of materials at the interface lead to the emergence of equilibrium and dynamic features in the interfacial systems that are far from those found in traditional 3D materials. These new properties are of importance in many scientific and technological fields, such as food science, cosmetics, biology, oil recovery, electronics, drug delivery, detergency, and tissue engineering. Therefore, the understanding of the theoretical and practical aspects involved in the preparation of these interfacial systems is of paramount importance for improving their usage for designing innovative technological solutions.

Keywords: interfaces; confinement; dynamics; materials; applications

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A fluid interface can be defined as the nanoscopic region of a system containing two fluid phases of different nature, commonly, a liquid combined with a second liquid or vapor, where the separation between two fluid phases occurs. This simple definition excludes many aspects of interest for the daily life of modern society. Fluid interfaces are ubiquitous in science and technology, which has stimulated extensive research activity aiming to disentangle the main physico-chemical bases governing the assembly of molecular and colloidal species in fluids, and to explore the properties of the obtained layers and the potential of the obtained quasi-2D systems for the fabrication of innovative functional materials [1,2]. Examples of the importance of the fluid interfaces appear in different products of interest for food science, e.g., oil–aqueous solution interfaces stabilizing the adsorption of different proteins are found in dietary emulsions such as mayonnaise or milk, and foams stabilized by the adsorption of different types of molecules with surface activity appear in beverages such as beer. Furthermore, interfacial phenomena play a fundamental role in the development of cosmetic formulations, with foams appearing in shampoos and bath gels, affecting consumer sensorial perception of the products (softness, creaminess, etc.) and even cleanliness feeling [3–5]. Interfacial phenomena also play a very important role in many processes of industrial interest, e.g., metal recovery by flotation, the tertiary recovery of oils, interfacial catalysis, gas storage, and biomass conversion [6–8]. In addition, there are many processes of biophysical and biochemical interest, such as endocytosis or the inhalation and transport of colloidal particles through the respiratory tract, in which the dynamic aspects of the behavior of fluid interfaces are involved (see work by Guzmán et al. [9] and Carrascosa-Tejedor et al. [10] in this Special Issue) [11,12]. Therefore, the understanding of the phenomena and applications involving fluid interfaces requires the combination of theoretical and experimental efforts from researchers belonging to a broad range of scientific areas, including chemistry, physics, biophysics, engineering, pharmacy, and cosmetic or materials science. Therefore, the study of fluid interfaces has become a multidisciplinary challenge, with its implications going beyond the understanding of the most fundamental bases governing the behavior of this type of system. This importance is clear from the growing number of publications devoted to the study of fluid interfaces published within the last 20 years (see Figure 1).

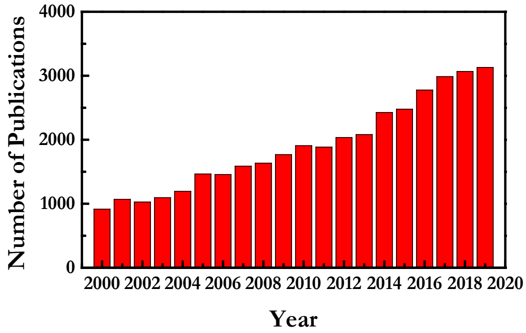

Figure 1. Number of publications per year devoted to the study of fluid interfaces (period 2000–2019) (source: Web of Science, Clarivate Analytics).

This Special Issue is devoted to the fundamental and applied aspects involved in the study of fluid interfaces, with the aim of providing a comprehensive perspective on the current status of the research field. It is expected that the work contained within this Special Issue can help to provide a bridge between the most fundamental knowledge on fluid interfaces and the development of new applications based on it, closing the gap between different approaches.

Conflicts of Interest: The author declares no conflict of interest.

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