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Editorial: Fundamentals, design and applications in process-intensifying equipment

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Editorial on the Research Topic
Fundamentals, design and applications in process-intensifying equipment

Process intensification in chemical engineering processes has been a topic of significant scientific interest for well over 20 years and its interest in the process industries for diverse applications is prevailing. A wide variety of process-intensifying equipment has been developed over this time and are currently used in industrial applications. This Research Topic focuses on the use of specific equipment for process intensification. It aims covering recent and novel research on process-intensifying equipment, ranging from the fundamental physical understanding of process improvement, performance characterization and design guidelines for such devices to applications of industrial interest.

Mixing is a cornerstone of process intensification. Often "intensified" reactors and heat exchange devices are simply novel and more effective methods of mixing. Hence, the measurement of mixing is a key underpinning technique in PI research. A variety of methods for *in situ* measurements of mixing have been developed, as different techniques are required for different circumstances, due to variations in the phases present, viscosities, opacities etc. In PI. Frey et al.'s paper, *"A Novel Approach for Visualizing Mixing Phenomena of Reactive Liquid-Liquid Flows in Milli- and Micro-Channels"*, the authors describe a new way of measuring small-scale flows, using spatially resolved imaging UV/Vis spectroscopy. The paper, (Matos et al.) "*Mixing in the NETmix Reactor*" illustrates the uses of simulation in design of intensified process technologies. It describes the modelling of a multiple chamber jet-impingement reactor, allowing optimisation of its geometric parameters.

One of the main forms of process intensification in practise is the conversion of inherently inefficient batch processes to more efficient continuous processing. A key element in this conversion is the presence or availability of the necessary analytical

equipment, to cope with shorter feedback times i.e. equipment that can analyse continually, rapidly and online. Ideally, the online techniques are spectroscopic, as such techniques tend to be very rapid. However, this is not always possible, particularly for complex mixtures and/or complex molecules, particularly pharmaceuticals. Escriba-Golonch et al.'s paper, "*Automated High-Pressure At-line Analysis of Photo-High-P,T Vitamin D3 Microfluidic Synthesis*" deals with this aspect of process intensification, in their development of an automatic HPLC for specific the pharmaceuticals in a microreactor.

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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.

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