243h Phenomena-Based Topological Representation of Chemical Processes

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Process Intensification has developed as a revolutionary design philosophy that provides step-change and combined advantages in process design. Its dramatic results are based in a structured design to make the process to perform at the appropriate lengthscale and timescale, according to the requirements at a close-to-molecular level. This involves a fundamental multiscale analysis and understanding of process phenomena without the spatial constraints of conventional unit operation models and associated equipment.

This contribution develops a graphical topology built upon multilevel phenomena-based concepts. The representation is an approach to the required multiscale modelling supporting the early stages of innovative process design. This is a more flexible equipment-independent representation that enables the capture of non-trivial features and exposes key phenomena, encouraging the generation of design strategies regarding process intensification and integration.

The topology has been designed to make the representation more intuitive and ease its assimilation. It may be interpreted as a representation of the process tasks that the process design must fulfil (i.e. the process requirements). The approach is useful to structure, identify and qualitatively model the phenomena taking place, which may be mapped into equations for a more rigorous mathematical modelling.