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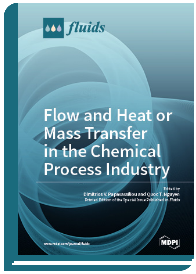
Special Issue Reprint

Flow and Heat or Mass Transfer in the Chemical Process Industry



www.mdpi.com/books/reprint/773

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ISBN 978-3-03897-238-9 (Softback)
ISBN 978-3-03897-239-6 (PDF)

Flow through process equipment in a chemical or manufacturing plant (e.g., heat exchangers, reactors, catalyst regeneration units, separation units, pumps, pipes, smoke stacks, etc.) is usually coupled with heat and/or mass transfer. Rigorous investigation of this coupling of momentum, heat, and mass transfer is not only important for the practice of designing process equipment, but is also important for improving our overall theoretical understanding of transfer phenomena. While generalizations and empiricisms, like the concept of the heat transfer coefficient or the widely used Reynolds analogy in turbulence, or the use of empirical transfer equations for flow in separation towers and reactors packed with porous media, have served practical needs in prior decades, such empiricisms can now be revised or altogether replaced by bringing modern experimental and computational tools to bear in understanding the interplay between flow and transfer. The patterns of flow play a critical role in enhancing the transfer of heat and mass. Typical examples are the coherent flow structures in turbulent boundary layers, which are responsible for turbulent transfer and mixing in a heat exchanger and for dispersion from a smoke stack, and the flow patterns that are a function of the configuration of a porous medium and are responsible for transfer in a fixed bed reactor or a fluid bed regenerator unit. The goal of this Special Issue is to be a forum for recent developments in theory, state-of-the-art experiments and computations on the interactions between flow and transfer in single and multi-phase flow, and from small scales to large scales, which can be important for the design of equipment in a chemical processing plant.

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