Special Issue

Flow Control Across Varying Length Scales: Nanofluidics, Microfluidics and Millifluidics

Message from the Guest Editors

Flow control across varying length scales —nanofluidics, microfluidics, and millifluidics—has unlocked transformative opportunities in science and engineering. Each scale presents unique challenges and capabilities, offering tailored solutions to enhance heat and mass transfer in the fine chemical industry and biomedical diagnostics. Nanofluidics focuses on controlling flows at a nanoscale, leveraging unique surface effects and molecular interactions. Microfluidics excels in precision control and integrates with technologies like MEMS, driving breakthroughs in lab-on-a-chip systems and personalized medicine. Finally, millifluidics extends the above principles to larger volumes, bridging the gap between microscopic precision and macroscopic practicality. This Special Issue explores innovations in flow control technologies across these scales, including advanced sensors, actuators, fluid control units, and detection mechanisms. By uniting insights across disciplines and length scales, this Special Issue aims to catalyze innovation, foster cross-disciplinary collaboration, and accelerate the development of scalable solutions for complex fluidic challenges.

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Deadline for manuscript submissions

20 December 2025

Fluids

an Open Access Journal by MDPI

Impact Factor 1.8
CiteScore 4.0

mdpi.com/si/233173

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