



Fluid Dynamics and Transport of Droplets and Sprays

By William A. Sirignano

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This book serves as both a graduate text and a reference for engineers and scientists exploring the theoretical and computational aspects of the fluid dynamics and transport of sprays and droplets. Attention is given to the behavior of individual droplets, including the effects of forced convection due to relative droplet-gas motion, Stefan convection due to the vaporization or condensation of the liquid, multicomponent liquids (and slurries), and internal circulation of the liquid. This second edition contains more information on droplet-droplet interactions, the use of the mass-flux potential, conserved scalar variables, spatial averaging and the formulation of the multi-continua equations, the confluence of spatial averaging for sprays and filtering for turbulence, direct numerical simulations and large-eddy simulations for turbulent sprays, and high-pressure vaporization processes. Two new chapters introduce liquid-film vaporization as an alternative to sprays for miniature applications and a review of liquid-stream distortion and break-up theory, which is relevant to spray formation.

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Review

"This book is informative, well written, appropriately illustrated with figures and carefully organized...It certainly merits acquisition by libraries at universities and research laboratories." Applied Mechanics Reviews

About the Author

William A. Sirignano is the Henry Samueli Professor of Mechanical and Aerospace Engineering and former Dean of the School of Engineering at the University of California, Irvine. Prior to that, he was the George Tallman Ladd Professor and Department Head at Carnegie-Mellon University and a Professor at Princeton University. His major research and teaching interests include spray combustion, turbulent combustion and ignition, aerospace propulsion, fluid dynamics, and applied mathematics. Dr Sirignano has written more than 450 research papers, book articles, and reports and delivered more than 300 conference presentations and research seminars. He has been a formal consultant to thirty industrial organizations and federal laboratories. Sirignano is a member of the National Academy of Engineering and a society Fellow in the AIAA, ASME, AAAS, APS, and SIAM. He is the recipient of the Pendray Aerospace Literature Award, Propellants and Combustion Award, Energy Systems Award, Wyld Propulsion Award, and Sustained Service Award from the AIAA and of the ASME Freeman Scholar Fluids Engineering Award, The Combustion Institute Alfred C. Egerton Gold Medal, and Institute for the Dynamics of Explosions and Reactive Systems Oppenheim Award.

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