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Autore	Marchisio Daniele L.
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functions (NDF)"; "2.1.1 Length-based NDF"; "2.1.2 Volume-based NDF"; "2.1.3 Mass-based NDF"; "2.1.4 Velocity-based NDF"; "2.2 The NDF transport equation"; "2.2.1 The population-balance equation (PBE)"; "2.2.2 The generalized population-balance equation (GPBE)"; "2.2.3 The closure problem"; "2.3 Moment-transport equations"; "2.3.1 Moment-transport equations for a PBE"; "2.3.2 Moment-transport equations for a GPBE"; "2.4 Flow regimes for the PBE"; "2.4.1 Laminar PBE"; "2.4.2 Turbulent PBE"; "2.5 The moment-closure problem"; "3 Quadrature-based moment methods"; "3.1 Univariate distributions"; "3.1.1 Gaussian quadrature"; "3.1.2 The product-difference (PD) algorithm"; "3.1.3 The Wheeler algorithm"; "3.1.4 Consistency of a moment set"; "3.2 Multivariate distributions"; "3.2.1 Brute-force QMOM"; "3.2.2 Tensor-product QMOM"; "3.2.3 Conditional QMOM"; "3.3 The extended quadrature method of moments (EQMOM)"; "3.3.1 Relationship to orthogonal polynomials"; "3.3.2 Univariate EQMOM"; "3.3.3 Evaluation of integrals with the EQMOM"; "3.3.4 Multivariate EQMOM"; "3.4 The direct quadrature method of moments (DQMOM)"; "4 The generalized population-balance equation"; "4.1 Particle-based definition of the NDF"; "4.1.1 Definition of the NDF for granular systems"; "4.1.2 NDF estimation methods"; "4.1.3 Definition of the NDF for fluid-particle systems"; "4.2 From the multi-particle-fluid joint PDF to the GPBE"; "4.2.1 The transport equation for the multi-particle joint PDF"; "4.2.2 The transport equation for the single-particle joint PDF"; "4.2.3 The transport equation for the NDF"; "4.2.4 The closure problem"; "4.3 Moment-transport equations"; "4.3.1 A few words about phase-space integration"; "4.3.2 Disperse-phase number transport"; "4.3.3 Disperse-phase volume transport"; "4.3.4 Fluid-phase volume transport"; "4.3.5 Disperse-phase mass transport"; "4.3.6 Fluid-phase mass transport"; "4.3.7 Disperse-phase momentum transport"; "4.3.8 Fluid-phase momentum transport"; "4.3.9 Higher-order moment transport"; "4.4 Moment closures for the GPBE"

Sommario/riassunto

Providing a clear description of the theory of polydisperse multiphase flows, with emphasis on the mesoscale modelling approach and its relationship with microscale and macroscale models, this all-inclusive introduction is ideal whether you are working in industry or academia. Theory is linked to practice through discussions of key real-world cases (particle/droplet/bubble coalescence, break-up, nucleation, advection and diffusion and physical- and phase-space), providing valuable experience in simulating systems that can be applied to your own applications. Practical cases of QMOM, DQMOM, CQMOM, EQMOM and ECQMOM are also discussed and compared, as are realizable finite-volume methods. This provides the tools you need to use quadrature-based moment methods, choose from the many available options, and design high-order numerical methods that guarantee realizable moment sets. In addition to the numerous practical examples, MATLAB scripts for several algorithms are also provided, so you can apply the methods described to practical problems straight away.