Formula 1

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Formula 2

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Formula 3

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Detailed Explanation

The handbook synthesizes decades of experimental and semi-empirical work in convective mass transfer, organizing correlations by geometry (e.g., flat plates, packed beds, fluidized beds, stirred tanks, pipes) and flow regime (laminar, turbulent, transitional). Central to its framework is the Chilton–Colburn analogy, which establishes equivalence between momentum, heat, and mass transfer via the dimensionless j-factor (j_D = Sh / (Re · Sc^{1/3})), enabling adaptation of well-established friction factor or Nusselt number correlations to mass transfer problems. Treybal's contributions emphasize correlations for equilibrium-stage operations—such as absorption, extraction, and distillation—with emphasis on interfacial area, holdup, and effective diffusivity in dispersed-phase systems. Perry's data provide broad coverage of physical property estimation (e.g., diffusion coefficients, viscosity, density) and standardized correlations for common equipment like plate columns, spray towers, and rotary kilns. The v3.2 edition includes updated property databases, expanded low-Reynolds-number correlations for microscale and viscous systems, and cross-referenced uncertainty guidance for each correlation—supporting rigorous error propagation in process simulation and scale-up.

Key Components

#	Component

1	Chilton–Colburn j-factor analogy
2	Empirical Sherwood–Reynolds–Schmidt correlations
3	Geometry- and operation-specific correlation tables

Applications

#	Application
1	Design and rating of absorbers and strippers
2	Scale-up of liquid–liquid extraction equipment
3	Prediction of drying rates in packed-bed dryers

Related Concepts

#	Concept
1	Dimensionless numbers in transport phenomena
2	Interfacial mass transfer resistance
3	Two-film theory

Tags

> mass transfer, dimensionless correlation, process design, transport phenomena, chemical engineering