
CONTENTS

Preface	ix
1 General Considerations	1
Introduction	1
Atomization	2
Atomizers	4
Factors Influencing Atomization	9
Spray Characteristics	18
Applications	20
Glossary	20
References	24
2 Basic Processes in Atomization	27
Introduction	27
Static Drop Formation	28
Breakup of Drops	29
Disintegration of Liquid Jets	37
Disintegration of Liquid Sheets	59
Summary	72
Nomenclature	73
References	75

3	Drop Size Distributions of Sprays	79
	Introduction	79
	Graphical Representation of Drop Size Distributions	79
	Mathematical Distribution Functions	82
	Empirical Distribution Functions	86
	Mean Diameters	90
	Representative Diameters	91
	Drop Size Dispersion	99
	Concluding Remarks	101
	Nomenclature	102
	References	102
4	Atomizers	105
	Introduction	105
	Atomizer Requirements	106
	Pressure Atomizers	106
	Rotary Atomizers	127
	Air-Assist Atomizers	136
	Airblast Atomizers	140
	Effervescent Atomizers	142
	Electrostatic Atomizers	144
	Ultrasonic Atomizers	146
	Whistle Atomizers	149
	References	150
5	Flow in Atomizers	155
	Introduction	155
	Flow Number	155
	Plain-Orifice Atomizer	156
	Pressure-Swirl Atomizer	165
	Rotary Atomizer	189
	Airblast Atomizer	193
	Nomenclature	196
	References	197
6	Atomizer Performance	201
	Introduction	201
	Plain-Orifice Atomizer	202
	Pressure-Swirl Atomizers	204
	Rotary Atomizers	222
	Air-Assist Atomizers	228
	Airblast Atomizers	238
	Effervescent Atomizer	261
	Electrostatic Atomizers	264

Ultrasonic Atomizers	265
Nomenclature	266
References	267
7 External Spray Characteristics	273
Introduction	273
Spray Properties	274
Penetration	279
Spray Cone Angle	281
Circumferential Liquid Distribution	298
Airblast Atomizers	300
Drop Drag Coefficients	301
Nomenclature	306
References	307
8 Drop Evaporation	309
Introduction	309
Steady-State Evaporation	310
Unsteady-State Analysis	330
Drop Lifetime	344
Convective Effects on Evaporation	348
Calculation of Effective Evaporation Constant	353
Influence of Evaporation on Drop Size Distribution	356
Drop Burning	360
Multicomponent Fuel Drops	361
Nomenclature	363
References	364
9 Drop Sizing Methods	367
Introduction	367
Factors Influencing Drop Size Measurement	369
Mechanical Methods	373
Electrical Methods	379
Optical Methods	380
Concluding Remarks	405
References	405
Author Index	411
Subject Index	417