

Contents

	Preface	iii
	Contributing Authors	v
1	Introduction <i>Gerhard Knothe</i>	1
2	The History of Vegetable Oil-Based Diesel Fuels <i>Gerhard Knothe</i>	4
3	The Basics of Diesel Engines and Diesel Fuels <i>Jon Van Gerpen</i>	17
4	Biodiesel Production	
4.1	Basics of the Transesterification Reaction <i>Jon Van Gerpen and Gerhard Knothe</i>	26
4.2	Alternate Feedstocks and Technologies for Biodiesel Production <i>Michael J. Haas and Thomas A. Foglia</i>	42
5	Analytical Methods for Biodiesel <i>Gerhard Knothe</i>	62
6	Fuel Properties <i>Gerhard Knothe</i>	76
6.1	Cetane Numbers–Heat of Combustion–Why Vegetable Oils and Their Derivatives Are Suitable as a Diesel Fuel <i>Gerhard Knothe</i>	76
6.2	Viscosity of Biodiesel <i>Gerhard Knothe</i>	81
6.3	Cold Weather Properties and Performance of Biodiesel <i>Robert O. Dunn</i>	83
6.4	Oxidative Stability of Biodiesel	
6.4.1	Literature Overview <i>Gerhard Knothe</i>	122

6.4.2	Stability of Biodiesel <i>Heinrich Prankl</i>	127
6.5	Biodiesel Lubricity <i>Leon Schumacher</i>	137
6.6	Biodiesel Fuels: Biodegradability, Biological and Chemical Oxygen Demand, and Toxicity <i>C.L. Peterson and Gregory Möller</i>	145
6.7	Soybean Oil Composition for Biodiesel <i>Neal A. Bringe</i>	161
7	Exhaust Emissions	
7.1	Effect of Biodiesel Fuel on Pollutant Emissions from Diesel Engines <i>Robert L. McCormick and Teresa L. Alleman</i>	165
7.2	Influence of Biodiesel and Different Petrodiesel Fuels on Exhaust Emissions and Health Effects <i>Jürgen Krahl, Axel Munack, Olaf Schröder, Hendrik Stein, and Jürgen Bünger</i>	175
8	Current Status of the Biodiesel Industry	
8.1	Current Status of Biodiesel in the United States <i>Steve Howell and Joe Jobe</i>	183
8.2	Current Status of Biodiesel in the European Union <i>Dieter Bockey</i>	194
8.2.1	Biodiesel Quality Management: The AGQM Story <i>Jürgen Fischer</i>	204
8.3	Status of Biodiesel in Asia, the Americas, Australia, and South Africa <i>Werner Körbitz</i>	211
8.4	Environmental Implications of Biodiesel (Life-Cycle Assessment) <i>Sven O. Gartner and Guido A. Reinhardt</i>	219
8.5	Potential Production of Biodiesel <i>Charles L. Peterson</i>	231
9	Other Uses of Biodiesel <i>Gerhard Knothe</i>	239
10	Other Alternative Diesel Fuels from Vegetable Oils <i>Robert O. Dunn</i>	241

11 Glycerol	
<i>Donald B. Appleby</i>	264
Appendix A: Technical Tables	277
Appendix B: Biodiesel Standards	287
Appendix C: Internet Resources	295
Index	296