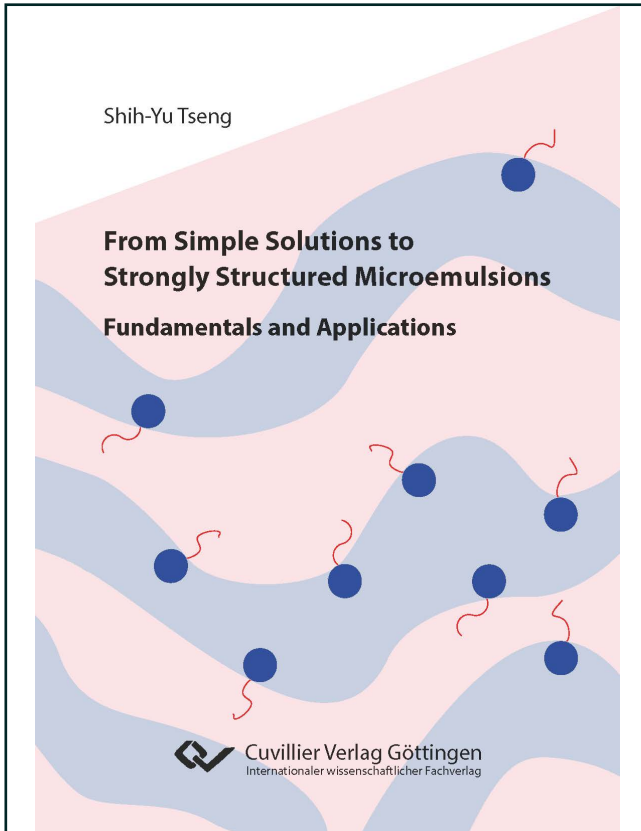




Shih-Yu Tseng (Autor)
**From Simple Solutions to Strongly Structured
Microemulsions**
Fundamentals and Applications



<https://cuvillier.de/de/shop/publications/8735>

Copyright:
Cuvillier Verlag, Inhaberin Annette Jentsch-Cuvillier, Nonnenstieg 8, 37075 Göttingen,
Germany
Telefon: +49 (0)551 54724-0, E-Mail: info@cuvillier.de, Website: <https://cuvillier.de>

Table of Contents

1	Introduction.....	1
1.1	Motivation.....	1
1.2	Task description	5
2	Fundamentals	7
2.1	Phase transitions and critical phenomena	7
2.1.1	Phase transitions	7
2.1.2	Critical phenomena.....	9
2.1.3	The Ornstein-Zernike theory	13
2.2	Phase behavior of multicomponent systems	17
2.2.1	Binary systems.....	17
2.2.2	Ternary systems	18
2.2.3	The tricritical point (TCP)	22
2.3	Microemulsions.....	25
2.3.1	Phase behavior.....	25
2.3.2	Microstructure	32
2.3.3	CO ₂ microemulsions.....	40
2.4	Scattering techniques	43
2.4.1	Introduction	43
2.4.2	Scattering experiments	47
2.4.3	Scattering theorems and models.....	51
3	From Simple Solutions to Structured Microemulsions	58
3.1	Before the tricritical point (TCP): simple solutions.....	61
3.1.1	Search for a symmetric miscibility gap.....	61
3.1.2	Microstructure dominated by critical fluctuations (SANS).....	68
3.1.3	Critical phenomena.....	77
3.1.4	Microstructure at molecular length scale (SWAXS).....	84
3.1.5	Search for the tricritical point (TCP).....	88
3.2	Formation of an amphiphilic film: towards classical microemulsions	93
3.2.1	Phase behavior.....	93
3.2.2	Microstructure	96
4	Efficiency Boosting Effect in Microemulsions with Novel Diblock Polymers	104
4.1	Nonionic aliphatic polycarbonate diblock polymers as efficiency boosters.....	106
4.1.1	Introduction	106
4.1.2	Phase behavior.....	107
4.1.3	Microstructure	112

4.2	Nonionic siloxane functionalized polycarbonate diblock polymers as efficiency boosters	118
4.2.1	Introduction	118
4.2.2	Phase behavior.....	119
5	Industrial Applications of Microemulsions	123
5.1	Polyol-rich CO ₂ microemulsions applied to the PU foam production	125
5.1.1	Polyurethane	126
5.1.2	Phase behavior.....	127
5.1.3	Microstructure	139
5.2	Salager equation for prediction of balanced microemulsions applied to EOR.....	145
5.2.1	Introduction	146
5.2.2	Phase behavior.....	149
5.2.3	Determination of coefficients	158
5.2.4	Microstructure	164
6	Summary	169
7	Appendix.....	175
7.1	Abbreviations and symbols.....	175
7.2	Chemicals	181
7.3	Experimental methods	183
7.3.1	Phase behavior measurement.....	183
7.3.2	Ring tensiometry.....	186
7.3.3	Nuclear magnetic resonance (NMR)	186
7.3.4	Small-angle neutron scattering (SANS)	187
7.3.5	Small/wide-angle X-ray scattering (SWAXS).....	188
7.3.6	Static light scattering (SLS).....	189
7.3.7	Electrical conductivity	190
7.4	Additional tables and figures	191
7.4.1	Analysis of the alcohol mixture distribution <i>via</i> NMR.....	191
7.4.2	Scattering behavior investigated <i>via</i> SLS	192
7.4.3	Another proof of bulk-contrast SANS data dominated by OZ scattering.....	193
7.4.4	Further analysis of the SWAXS data.....	195
7.4.5	Phase diagrams of SANS samples in chapter 5.2	199
	Bibliography	201