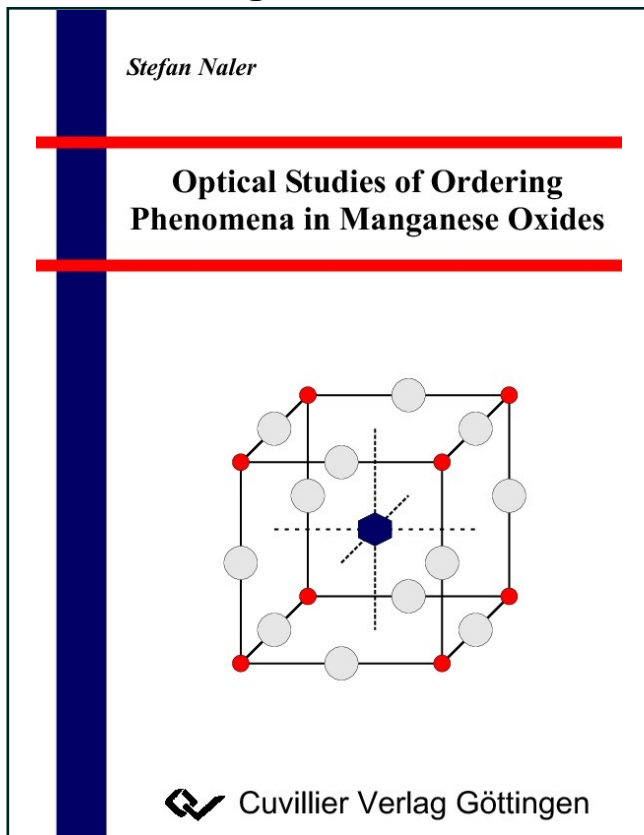




Stefan Naler (Autor)
**Optical Studies of Ordering Phenomena in
Manganese Oxides**



<https://cuvillier.de/de/shop/publications/2657>

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>

Contents

Contents	9
List of Tables	11
List of Figures	13
1 Introduction	19
2 Ellipsometry	21
2.1 Theory of Ellipsometry	21
2.1.1 Spectroscopic Ellipsometry Setup	21
2.1.2 Polarization Ellipsoid	23
2.1.3 Jones Vector Formalism	24
2.1.4 Stokes Vector Formalism	25
2.1.5 Inversion of the Ellipsometric Equation for a Bulk System	26
2.2 Experimental Equipment	29
2.2.1 Sentech 850 SE Ellipsometer	29
2.2.2 Micro Probes	29
2.2.3 Cryostat	30
2.2.4 Alignment	31
3 Raman scattering	33
3.1 The Raman Effect	34
3.1.1 Quantum-Mechanical Approach	35
3.1.2 Line Shapes	39
3.2 Raman Spectrometers	42
3.2.1 The Dilor XY Raman Spectrometer	42
3.2.2 The UT-3 Raman Spectrometer	46
4 Manganites	51
4.1 Properties of Manganites	52
4.1.1 Crystal and Electronic Structure	52
4.1.2 Magnetic Properties	56
4.1.2.1 Superexchange	57

4.1.2.2	Double exchange	59
4.1.2.3	CMR Effect	60
4.1.3	Ordering Phenomena	61
4.2	Perovskite Manganites: $\text{La}_{1-x}\text{Ca}_x\text{MnO}_3$	62
4.2.1	Temperature Dependent Raman Study on $\text{La}_{1-x}\text{Ca}_x\text{MnO}_3$	63
P I	Lattice dynamics and charge ordering in $\text{La}_{1-x}\text{Ca}_x\text{MnO}_3$ ($0.45 \leq x \leq 0.76$)	74
4.2.2	Resonance Raman Study on LaMnO_3	74
P II	Orbital ordering in LaMnO_3 investigated by Resonance Raman Spectroscopy	81
4.3	Layered manganites: $\text{La}_{2-2x}\text{Sr}_{1+2x}\text{Mn}_2\text{O}_7$	81
P III	Optical study of competition between ordering and metallicity in LSMO327	91
4.4	Variation of the unit cell: $\text{Sr}_{1-x}\text{Ca}_x\text{MnO}_3$	91
P IV	Inelastic light scattering study and optical properties of $\text{Sr}_{1-x}\text{Ca}_x\text{MnO}_3$	107
5	Conclusions and Outlook	107
	Bibliography	109
6	Acknowledgments	119
A	Raman Spectra Corrections	121
A.1	Corrections Due to the Spectrometer	121
A.2	Bose Correction	123
A.3	Effective Sample Volume	123
B	ElliPy2	129
B.1	Installation	130
B.2	Starting ElliPy2	131
B.3	Using ElliPy2	132
B.4	Command Overview	133