

Contents

Contents

i

1	Introduction	1
1.1	Principles	3
1.2	Outline of the thesis	16
	References	17
2	Methods	25
2.1	The Setup	25
2.2	Data Evaluation	28
3	Ultrafast Transient Absorption Studies on $Pr_{0.65}Ca_{0.35}MnO_3$	33
3.1	Introduction	34
3.2	Results	37
3.3	Discussion	49
3.4	Summary and Conclusion	52
3.5	Contributions	54
	References	55
4	Ultrafast Transient Absorption Studies on $[Rh_2(dimen)_4](PF_6)_2$	65
4.1	Introduction	66
4.2	Results	69
4.3	Discussion	107
4.4	Summary and Conclusion	115
	References	118
5	Summary	127

A	Supporting Information ($Pr_{0.65}Ca_{0.35}MnO_3$)	129
A.1	Setup of the Transient Absorption Spectrometer	130
A.2	Sample Preparation of the PCMO Thin Film	131
A.3	Power Dependent Transmission and Optical Density	133
A.4	Transient Absorption Measurements	135
A.5	Optical Transitions in PCMO	136
A.6	Analysis of the Change in Optical Density	138
A.7	Analysis of the Long-Term ps Coherent Oscillations	141
A.8	Analysis of the Short-Term ps Coherent Oscillations	142
A.9	Analysis of the fs Coherent Oscillations	145
A.10	Power Dependence of the Picosecond Dynamics	148
A.11	Power Dependence of the Slow Relaxation Process	151
A.12	Resolution Limits of the Deconvolution	152
A.13	Orbital scheme of the Zener Polaron	155
A.14	The Relaxation Process in the Jahn-Teller Dimer	158
A.15	Temperature Dependence of Open Circuit Voltage	161
A.16	The contribution of heat decay to the slow relaxation process	163
	References	171
	Acknowledgement	175
	Curriculum Vitae	177