

SUMMARY OF Ph.D. DISSERTATION

School Integrated Design Engineering	Student Identification Number	SURNAME, First name FUJIHARA, Takashi
Title <p style="text-align: center;">A study on lightwave control using photorefractive polymers</p>		
Abstract <p>Research and development in laser physics have been rapidly expanded these twenty years, and many applications of photonics are now being relevant to the industrial and consumer markets. In the near future, it is expected that photonics will be utilized in new and important fields such as medicine, biology, and nanotechnologies. In addition, more efficient optical information technology with low energy consumption will be required. For its realization, nonlinear-optical (NLO) effects will be key issues.</p> <p>In this thesis, light manipulation using the photorefractive (PR) effect, one of the NLO effects, in polymer materials was studied.</p> <p>First, in Chap. 1, the contents of this paper are described and the history of studies of the PR effect is introduced.</p> <p>In Chap. 2, a fundamental model of the PR effect in polymers and the coupled -wave equations necessary for the light manipulation is theoretically treated.</p> <p>In Chap. 3, the simplified procedure of evaluating the electronic properties of the PR polymers is proposed and its validity is experimentally confirmed.</p> <p>In Chap. 4, as the first example of light-light controls, a technique of SHG enhancement using the anti-guide structure fabricated via the PR effect is shown.</p> <p>In Chap. 5, as the second example of light-light controls, the two-wave coupling (TBC) in high performance PR polymers and the amplified scattered light inherent to the PR materials are studied. By optimizing the device structure, the efficient TBC is realized.</p> <p>In Chap. 6, based on the knowledge of the amplified scattered light, the first result of generating the surface waves in the PR polymers is described. The detailed mechanism of the temporal behavior of the surface wave generated is evaluated by estimating the intensity distribution of the output beam.</p> <p>Finally, in Chap. 7, conclusions are summarized and the feature view of the PR polymer materials is described from the standpoints of the fundamental studies and applications.</p>		