

Preface

Precision optical components (i.e., Lens and Mirrors) of high quality are necessary for advanced optical imaging and lighting systems, such as Next Generation Space Telescope (NGST) and Solar Energy Lighting and National Ignition Facility Project (NIF). The optical finishing process enables to make optical surfaces with high accuracy and performance. Conventional techniques rely basically on the skills of craftsmen using the pitch tool, which is a time-consuming and iterative process. Nowadays, specifications for surface quality, roughness, and manufacturing efficiency are more stringent, and traditional methods cannot satisfy such demands. Deterministic sub-aperture optical finishing systems employ a series of pose-varied multi-axis machines to remove residual surface errors.

This book presents some basic theories of optical finishing systems, and process validations for different parameters related to the main results in this book. Further researches were performed on such parameters as orbits, velocity, and pressure. More attention will be paid to detailed process experiments to verify the models; at the same time, system errors and edge effects are also studied carefully. The book contains five chapters:

In Chap. 1, optical surfaces applied on complex systems are modeled. Especially, modeling is introduced on the whole surface coverage. In Chap. 2, definition and synthesis on different orbits are given. In Chap. 3, to utilize the series of optical finishing machines fully, methods for conquering the dynamic limitation of velocity are derived. In Chap. 4, prediction on dwell effects and nonlinear pressure distribution are researched. In Chap. 5, facing the testing and finishing process, correction on data matching and remounting errors is analyzed. Also, processing validations relating to each parameter is performed.

Pose-varied Multi-axis Optical Finishing Systems

Theory and Process Validation

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