

# Preface

Surface is everywhere. Even the surface of this paper just reflects the availability of presenting the knowledge acquired by many scientific laboratories worldwide about the surface properties during interaction of the laser light with the matter. Is it interesting or not? The reader can partially answer on this question by reading the introduction to this book describing the motifs lying behind my willingness to combine the knowledge about this interesting and important component of matter.

The motivation of writing this book also includes my vision of the classification of the processes of laser-surface interaction. The laser intensity is a parameter, which distinguishes various processes occurring on the surface when this coherent radiation interacts with various materials. The gradation of linear and nonlinear optical processes by intensity scale allows separating different mechanisms during laser-surface interaction. The pulse duration of laser radiation becomes a crucial parameter, which defines the processes appearing during this interaction. By defining the light, medium, and strong levels of interaction one can distinguish and classify the surface responses.

My goal was to acquaint the reader with a broad range of laser-surface processes in a single edition. Starting from very weak interaction of the surface of earth satellites with the unfocused laser radiation and finishing with relativistic processes occurring on the ablated surface at the laser intensity of the order of  $10^{20} \text{ W cm}^{-2}$  I wanted to show the consequence of the processes on the irradiated vacuum-matter or air-matter border occurring with the growing loading of photons. Both the practical aspects of applications of the physical processes occurring on the irradiated and/or ablated surface and the scientific assumptions lying behind the observed peculiarities of laser-surface interaction are in the scope of this book. I hope that the reader can find some valuable information depending on the area of his interests and expertise. The emphasis will be done on the experimental studies in this field.

This book is based on the results reported during last few years by leading scientists in different fields of light-surface interactions, as well as my experience in some of these areas. They include my both linear optical and nonlinear optical studies carried out in the laboratories worldwide. I studied various laser-surface interactions in collaboration with numerous researchers from Japan, India, Uzbekistan,

Malaysia, France, Canada, Germany, Ukraine, United Kingdom, Russia, Spain and other countries.

The important component of this research is a collaboration with many scientific groups. The studies presented in this book are partially based on my collaboration with those researchers and could not be realized without their generous efforts. I would like to thank all of them for long lasting scientific ties and discussions of various aspects of laser-surface interactions. I thank H. Kuroda, P. D. Gupta, P. A. Naik, T. Ozaki, J. P. Marangos, J. W. G. Tisch, and H. Zacharias for the fruitful discussions and support during our joint collaborative studies. I enjoyed the discussions with A. L. Stepanov, M. K. Koldirov, N. V. Kamanina, M. Castillejo, A. A. Ishchenko, A. I. Rvasnyansky, P. V. Redkin, N. Azmi, M. Suzuki, M. Baba, T. Q. Jia, L. B. Elouga Bom, H. Singhal, J. A. Chakera, M. Tudorovskaya, C. Hutchison and many other researchers regarding the past, present, and future joint studies of laser-surface interactions.

My family has generously supported me during all these years of my multiple trips around the globe, and my wife Lida, son Timur, and daughter Dina always can be considered as the motivations of all my adventures and achievements.

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