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Preface

Immediately after the laser was innovated in 1960, chemists started to utilize it in their specializing fields. High resolution spectroscopy and time-resolved spectroscopy have been some of the most attractive subjects for physical chemists, while multiphoton ionization, isotope separation, and photopolymerization were typical laser applications to chemistry. In these experiments, chemists found that pulsed laser irradiation of gas and liquids generates sound and spark, and irradiation of solid materials brings about melting, vaporization, and fragmentation, sometimes leaving a hole. The importance of this phenomenon was recognized by material scientists and electronics engineers, who have used it to develop new fabrication and processing techniques. In the early 1980s, Drs. Srinivasan's and Namba's groups demonstrated that the phenomenon is very useful for microfabrication and that it has potential for physical and chemical processing. Since then, it has been known as laser ablation and a number of reports have been published. Some spectroscopists and photochemists have applied their advanced techniques to elucidate the mechanisms, e.g., it was shown that photothermal ablation is due to cyclic multiphotonic absorption in the framework of the Jablonski diagram. Namely, laser ablation can be understood in the same terms as normal photophysics and photochemistry. Later, various time-resolved imaging techniques were developed and introduced for interrogating laser-induced morphological changes of material surface. By integrating these results, it becomes possible to bridge gaps between photoprimary processes and morphological changes. In other words, we should soon be able to understand how excitation energy evolves to vaporization, melting, expansion, fragmentation, ejection, etc. Indeed, this is one of the important problems in photochemistry.

We hope this special issue on laser ablation will advance fundamental studies on laser ablation and related phenomena, and eventually contribute to developments in new technology based on photochemistry.

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