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Towards Visualizing the Driving Principle of a Photochemical Reaction by Means of Time-Resolved Electron and Atomic Momentum Spectroscopies

MASAHIKO TAKAHASHI, IMRAM, Tohoku University

One of the goals in the field of chemical reaction dynamics may be to watch reactions in real time. Indeed, a variety of time-resolved spectroscopic techniques have been developed so far. Nevertheless, there still remains a challenge in exploring why the atoms are dancing in such a way. To tackle with the challenge, we have been developing a real-time spectroscopic complex, which consists of time-resolved versions of (e, 2e) electron momentum spectroscopy (TR-EMS) and atomic momentum spectroscopy (TR-AMS). TR-EMS is designed to measure in real time the momentum distributions of each electron, bound in a decaying system, with different binding energies. The observed change in electron motion represents the driving force behind chemical reaction. On the other hand, TR-AMS aims to measure the momentum distributions of each atom, involved in a decaying system, with different mass numbers, which tell about how and how much the change in atomic motion is brought about by the change in electron motion. In the contribution, present status and future prospect of this new real-time spectroscopic complex will be reported and discussed.