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Laser spectroscopic study of jet-cooled non-volatile molecules combined with laser ablation

Seiya Kenjo[1], Shingo Nakayama[1], Fumiya Morishima[2], Yoshiya Inokuchi[2], Takayuki Ebata[2]

[1] Department of Chemistry, Faculty of Science, Hiroshima University

[2] Graduate school of Science, Hiroshima University

[Introduction] In our laboratory, we have been carrying out supersonic jet / laser spectroscopic experiments of large polyatomic molecules such as crown ethers(CEs) and calix arenes(CAs), which are typical molecules in host-guest chemistry. The supersonic jet / laser spectroscopic experiment was successfully applied to those molecules by using heating nozzle. However, for larger molecules, such as calix [6] arene(C6A) and C8A, the thermal heating decomposes them. Therefore, laser ablation is indispensable for the spectroscopic study of these molecules and their inclusion complexes. In the present study, we introduce our development of laser ablation / supersonic jet / laser spectroscopic study for non-volatile larger polyatomic molecules. The target samples are amino-acids, cinnamic acid derivatives, CEs and CAs.

[Experimental] The schematic diagram of the experimental is shown in Fig.1. The pellet of the sample was made by pressing mixture of the solid powder of samples and carbon black. The sample pellet was irradiated by fundamental 1064 nm of Nd:YAG laser to vaporize the molecule. The sample vapor was diluted by Ar carrier gas ejected from the pulsed valve, generating supersonic jet. The UV spectrum of jet-cooled molecules were obtained by resonant two-photon ionization (R2PI).

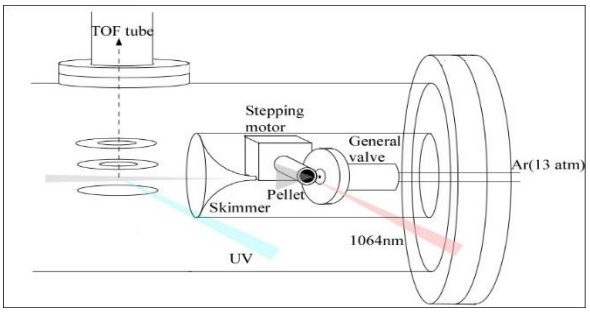

Fig.1 **Experimental setup of laser ablation / supersonic beam / laser spectroscopy**

[Results and Discussion] Fig.2 shows the $S_1 \leftarrow S_0$ electron spectra of (a)Methyl trans-p-Coumarate and (b)Sinapic acid obtained by 2 color R2PI spectroscopy. Both the spectra show sharp vibronic structure due to the cooling effect. Thus, the laser ablation / supersonic jet / laser spectroscopy has been sucessfully applied to these molecules. The advantages and some difficulties of this method will be discussed.

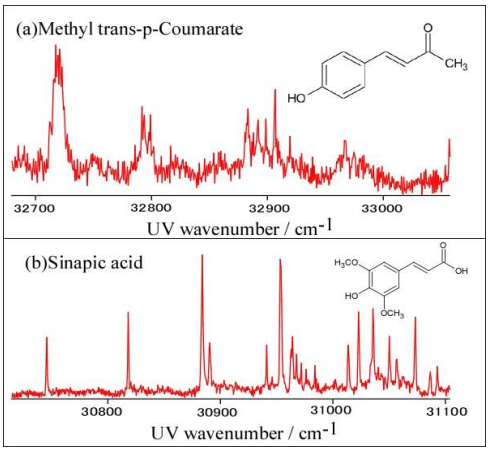

Fig.2 **R2PI spectra of jet-cooled (a)Methyl trans-p-coumarate (b)Sinapic acid**