Molecular structure conversion of stored monoanions in electrostatic storage ring

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Photodissociation was studied using an electrostatic storage ring (Fig. 1) for fluorescein and its 5-carboxyfluorescein analogue monoanions (Fig. 2) [1]. Ions were produced by an electrospray ion source and stored in an ion trap. They were subsequently injected into the ring after their acceleration to 20 keV. The stored ions were irradiated by an OPO laser (wavelength: 410–650 nm) and neutral products were detected. The storage time was variable up to the order of seconds.

The photodissociation neutral spectra as a function of time vary depending on the storage time (Fig. 3) as well as the laser wavelength. By comparing the wavelength spectra of our study with absorption spectra reported recently, we deduced that the spectra originated from different tautomers (MAC and MAF in Fig. 2). Moreover, the wavelength spectra vary during long-term storage in the storage ring. The origin of this phenomenon is attributed to the interconversion of tautomers.

Similar results were also observed for desodiated orange I monoanions ([M-Na]-, M: C₁₆H₁₁N₂NaO₄S), which also exhibit tautomerism (azo and hydrazone forms).

Fig. 1 Experimental setup.

Fig. 2 Chemical structures of fluorescein monoanions.

Fig. 3 Time spectra for different storage times in the ring.

References