

AccuTOF-GCv Series

Analysis of Advanced Materials by FD/FI Part IV

NIR-photosensitive Dyes

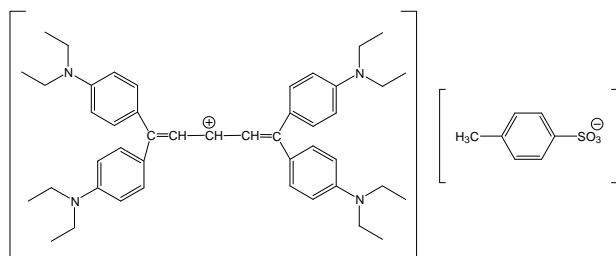
Introduction

Field desorption (FD) is an ionization method that utilizes electron tunneling in a high electric field near the emitter surface or whisker tip. Sample is applied directly on the emitter, and is then heated by applying an electric current through the emitter for desorption and ionization. FD has been used to analyze nonvolatile compounds, polymers, etc. as a soft ionization method that produces intact molecular ions with very few fragment ions in most cases.

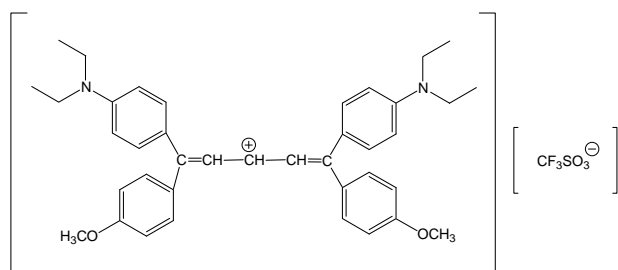
In this work, we used FD to analyze several near infrared (NIR) photosensitive dyes that were designed as photoinitiators for the polymerization of functional polymers.

Methods

Samples : NIR photosensitive dyes (Showa Denko K.K.)



(1) IRT ($[C_{45}H_{59}N_4]^+[C_7H_7SO_3]^-$)



(2) IR13F ($[C_{39}H_{45}O_2N_2]^+[CF_3SO_3]^-$)

MS conditions

Mass spectrometer: JMS-T100GC "AccuTOF GC"
 Acquired mass range: m/z 30 – 900
 Spectral recording interval: 0.3 sec
 Ionization mode: FD+
 Cathode potential: -10 kV
 Emitter current program:
 0 mA \rightarrow 51.2 mA/min \rightarrow 40 mA

Results and Discussion

The molecular ions $[(Anion)(Cation)]^+$ were observed for both samples by using FD. For the IRT sample, the cation portion of the salt was the base peak at m/z 655 as shown in Fig. 1 (a) above. In addition, the $[(Cation) - C_2H_4]^+$ at m/z 627 and $[(Anion) + H]^+$ at m/z 172 were observed for this compound. The IR13F sample also had the cation portion of the salt as the base peak at m/z 573 as shown in Fig. 1(b). For this sample, the molecular ion at m/z 722 was relatively strong when compared to the IRT sample. Additionally, the characteristic ion for IR13F in the mass spectrum was m/z 287 which is the double-charged ion for the salt cation.

Conclusion

FD is an effective tool for detecting the molecular ions and salt cations for NIR photosensitive dyes that are salts.

Acknowledgement

We would like to acknowledge the Fine Chemicals Group, Specialty Chemicals Department, Chemicals Division, SHOWA DENKO K.K, for generously providing the samples used in this work.

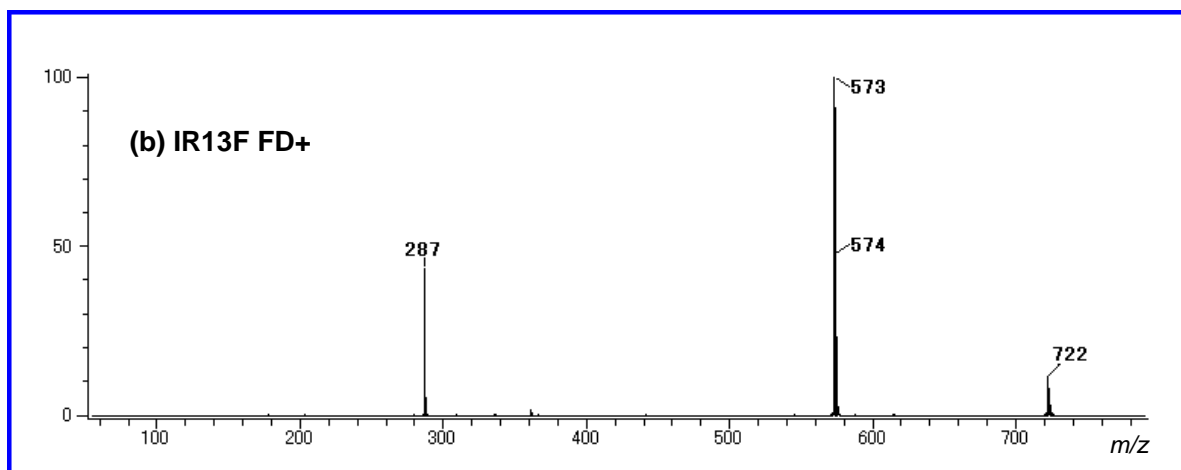
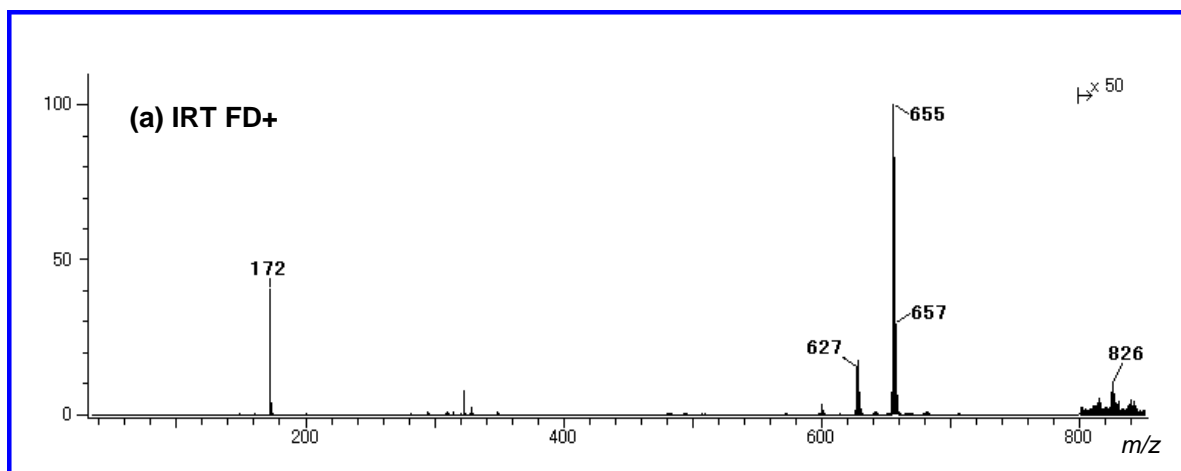
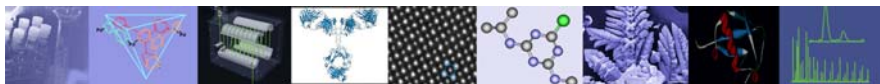


Fig. 1 FD+ mass spectra of organic borate ammonium salts