

AccuTOF-GCv Series

Analysis of Advanced Materials by FD/FI Part III

Organic Borates, Photoinitiators for Polymerization

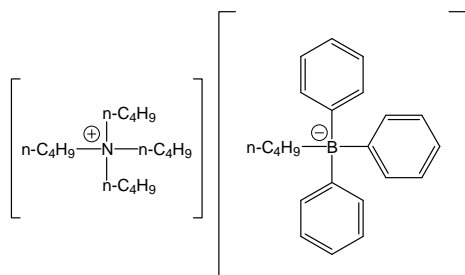
Introduction

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 to 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.

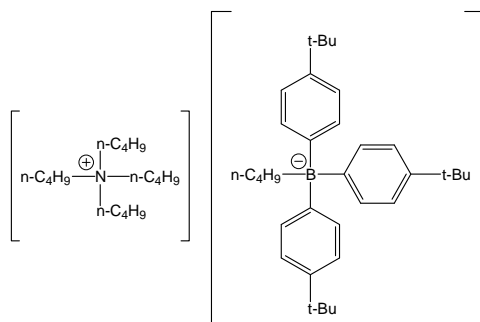
In this work, we used FD to analyze several quaternary borate ammonium salts that are designed as photoinitiators for the polymerization of functional polymers.

Methods

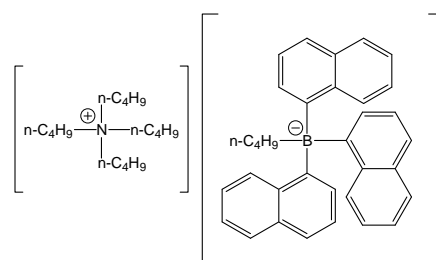
Samples : Quaternary borate ammonium salts (Showa Denko K.K.)



(1) P3B ($[C_{16}H_{36}N]^+[C_{22}H_{24}B]^-$)



(2) BP3B ($[C_{16}H_{36}N]^+[C_{34}H_{48}B]^-$)



(3) N3B ($[C_{16}H_{36}N]^+[C_{34}H_{30}B]^-$)

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

Molecular ions $[(\text{Anion})(\text{Cation})]^+$ were not detected for all three quaternary borate ammonium salts. The quaternary ammonium cation at m/z 242 ($[C_{16}H_{36}N]^+$) was observed as the base peak for all samples. The ions that correspond to the $[(\text{Anion}) - H]^+$ were observed for all samples, though they are relatively weak. For BP3B and N3B, ions that correspond to the $[(\text{Anion}) - C_4H_9]^+$ at m/z 410 and at m/z 392, respectively, were also observed.

Conclusions

With FD, the cation part of salts was clearly detected for these quaternary borate salts. Additionally, we found that the anion part of the salts can be detected as a de-protonated cation.

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.

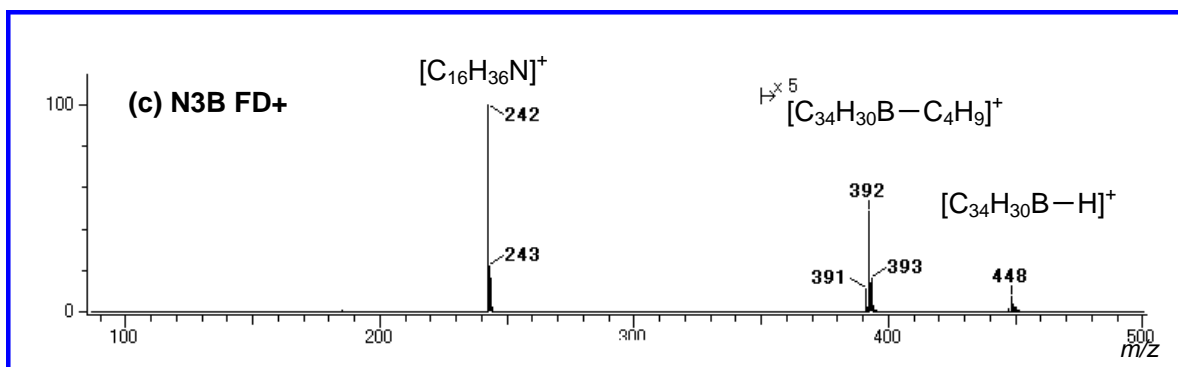
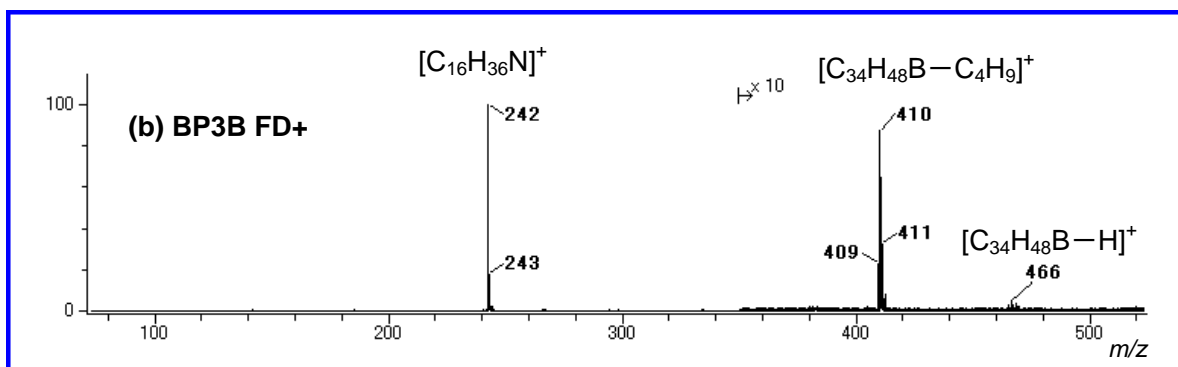
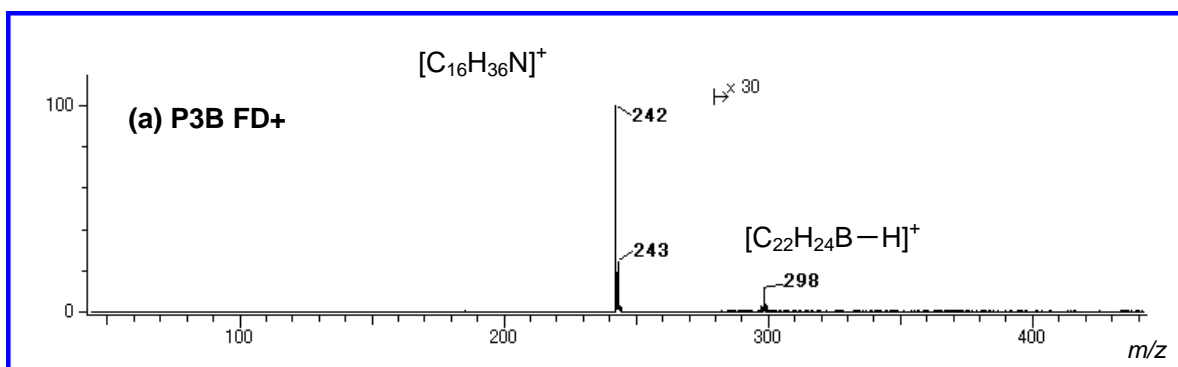
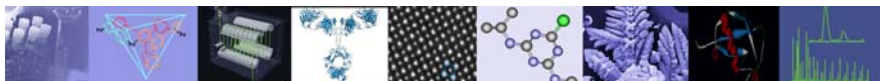


Fig. 1 FD+ mass spectra of organic borate ammonium salts