LC-MS Application Data Sheet No. 041

Analysis of Cationic/Nonionic Surfactants using LC-MS

Surfactants are widely used in various industrial fields, including production of domestic synthetic detergents, owing to their ability to reduce surface tension. Nowadays, with the increasing awareness of environmental problems, concerns have been arising for the influence of surfactants contained in domestic and industrial wastewater on the environment and living organisms. Investigations are therefore being undertaken to monitor it.

There are many types of surfactants such as anionic, cationic, and nonionic. Introduced here are examples of analyses of the cationic surfactant benzalkonium (C13) and the nonionic surfactant, polyoxyethylene lauryl ether (Brij-35).

The mass chromatogram of benzalkonium and the mass spectrum of peak 2 (C13) are shown in Figs.1 and 2 respectively. Components in surfactants, which include substances with different carbon numbers, can be accurately identified and quantified by performing mass chromatography at a specific mass number. From the mass chromatogram, it can be qualitatively determined that peak 1 is C11 and peak 3 is C15.

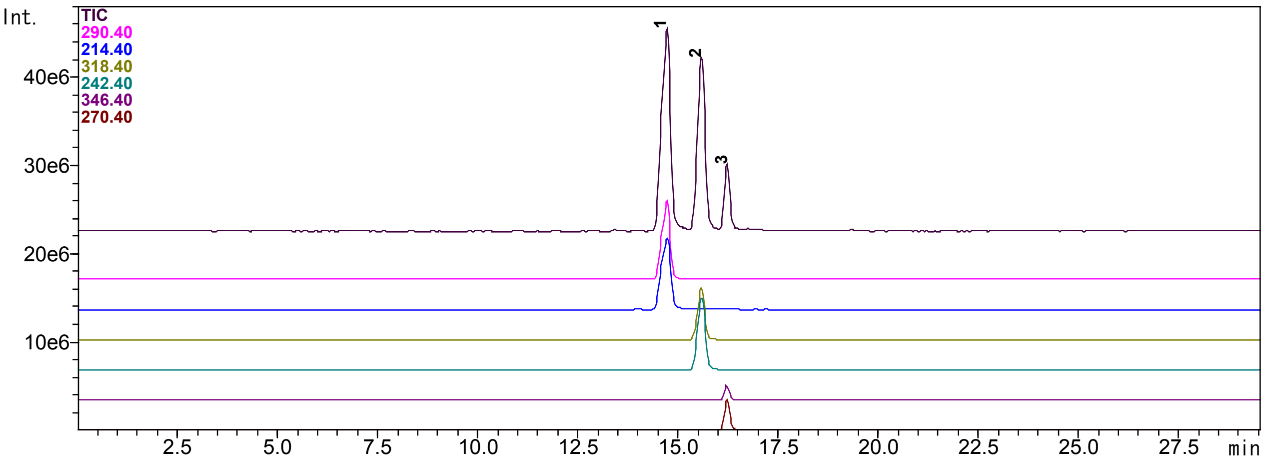


Fig. 1 Mass chromatograms of benzalkonium

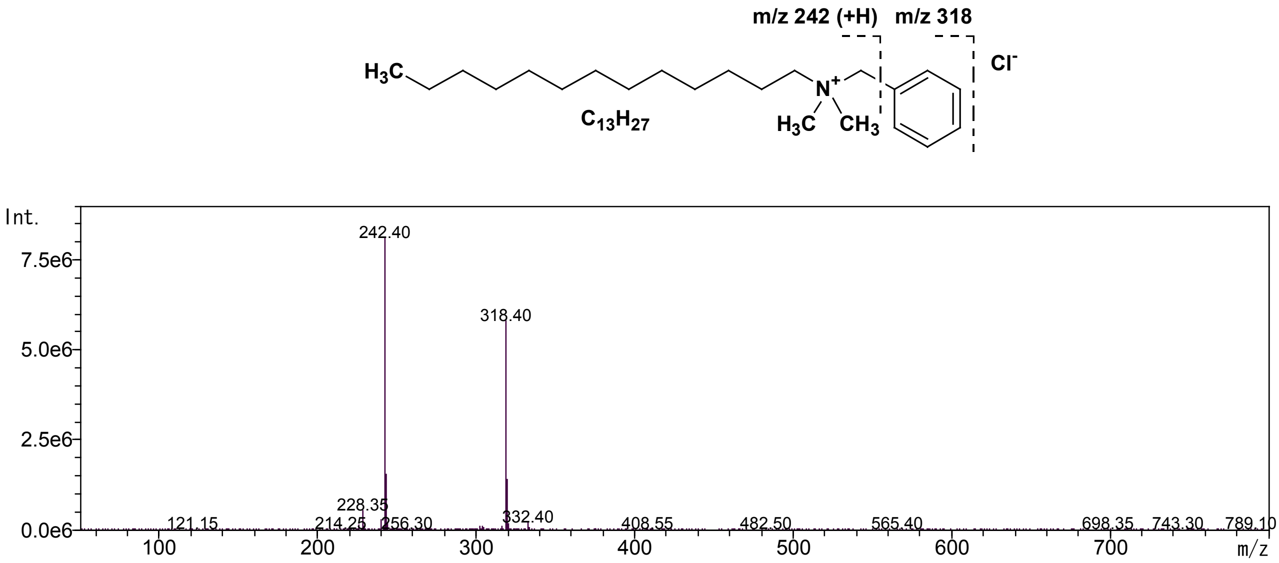


Fig. 2 Mass spectrum of benzalkonium (C13)

The mass chromatogram and the mass spectrum of polyoxyethylene lauryl ether are shown in Figs.3 and 4 respectively. Even if the separation in the HPLC is insufficient, components can be accurately identified and quantified by performing mass chromatography at a specific mass number.

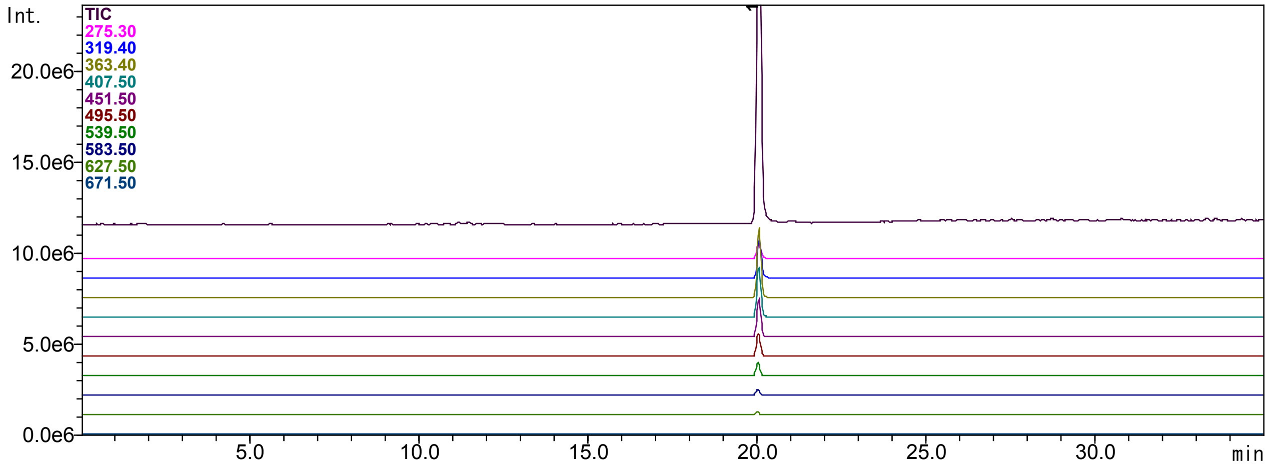
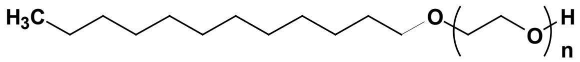


Fig. 3 Mass chromatograms of polyoxyethylene lauryl ether



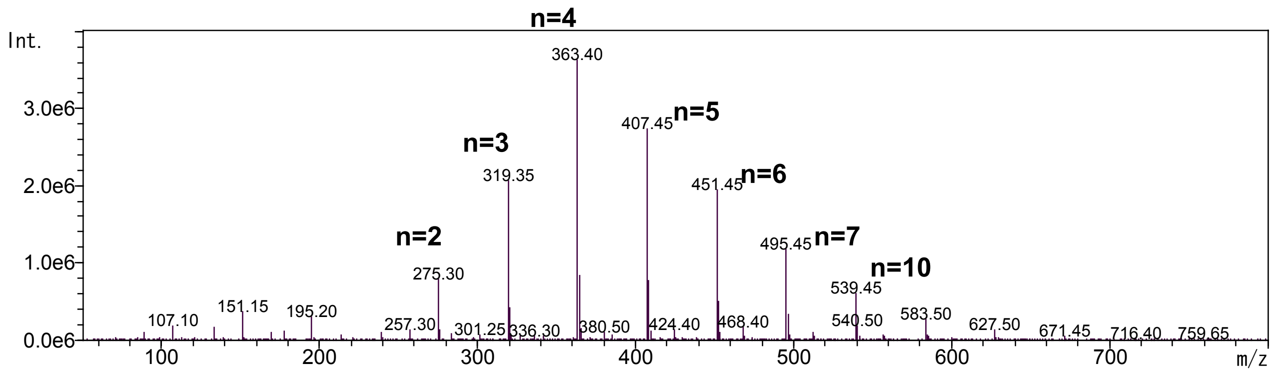


Fig. 4 Mass spectrum of polyoxyethylene lauryl ether

Table 1 Analytical conditions for LC-MS

Column	: Shimadzu VP-ODS (2.0 mmI.D. x 150 mm)		
Mobile phase A	: water containing 0.2% acetic acid		
Mobile phase B	: methanol		
Gradient program	: 10% B - 100%B(15min) - 100%B(35min) - 10%B(35.01-45min)		
Flow rate	: 0.2 mL/min		
Injection volume	: 5 uL	**Column temperature**	: 40 degree C
Probe voltage	: +4.5 kV (APCI-Positive mode)		
Probe temperature	: 400 degree C		
CDL temperature	: 230 degree C		
Nebulizing gas flow	: 2.5 L/min		
CDL voltage	: -40 V		
DEF's voltage	: +37 V		
Scan range	: m/z 50 - 800 (1.5 sec/scan)		

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