Direct analysis of lubricating oils

BACKGROUND Lubricating oils are composed of base oil and additives. In order to satisfy the high specific demands accompanying the development of machinery and automobiles, synthetic base oils and various additives are used. Generally, complicated pre-treatment is necessary for lubricant analysis, extending the time and increasing the effort required to obtain results. If analysis without pre-treatment is possible, it will be useful for research and development.

In this application, direct analysis of automobile engine oil was carried out using ionRocket combined with DART®-MS without any pretreatment.

SAMPLE Automobile engine oil

METHOD Automobile engine oil (1 μl) was put into the ionRocket sample pot. A temperature gradient heating from room temperature to 600°C was applied, the heating rate was 100°C/min (total run time:7 min.)

RESULTS The analysis results of automobile engine oil (heat map, horizontal axis: m/z, vertical axis: temperature) are shown in Fig. 1. Many high intensity compounds were detected at 300°C and compounds with a repeating unit structure which seems to be a polymer were detected at 450°C.

Mass spectra at 300°C and 450°C are shown in Fig. 2. Additives in the automobile engine oil such as phenolic antioxidants, amine antioxidants, and salicylic acid detergent dispersants were detected, as well as the base oil.

By using this analytical method, additives and base oil in the automobile engine oil can be analyzed directly. Therefore the cost and time of research and development could be reduced. Moreover, this analysis method could be applied to evaluate the degree of degradation of lubricating oil. In our next analysis application, we will report on "Evaluation of the degradation degree of lubricating oil".
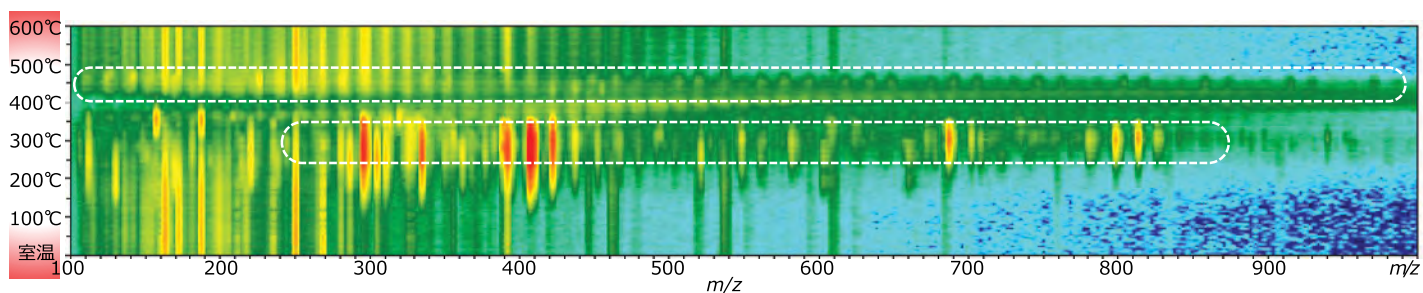

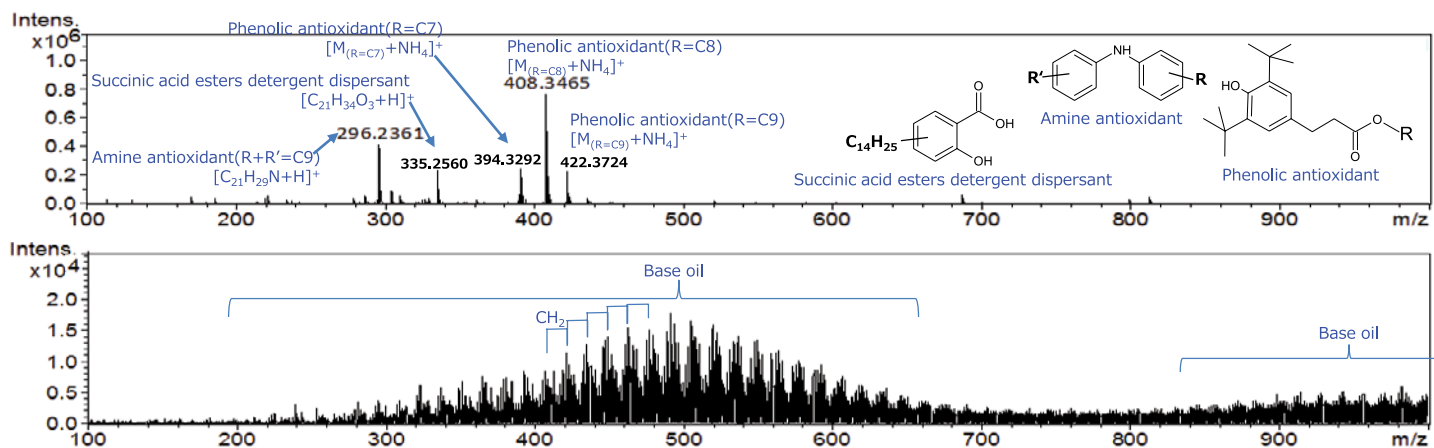**Figure 1. Heat map of the automobile engine oil (horizontal axis: m/z, vertical axis: temperature)**

Figure 2. Mass spectra at 300 and 450 (upper : 300°C, lower : 450°C)

TARGET Automobile Engine Oil | Base Oil Additives

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ionRocket