The collaboration research for the Dual Graduate School between VNU and JAIST

[Title of collaboration research]:

Novel approach for quantitative analysis of environmental nano pollutant by desorption ionization on silicon coupled with Fourier transform ion cyclotron resonance mass spectrometry

[The members of collaboration research]:

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[Reference home-page address]:http://www.jaist.ac.jp/ms/labs/kyokugen/Miyake.lab/new/html/frame.htm

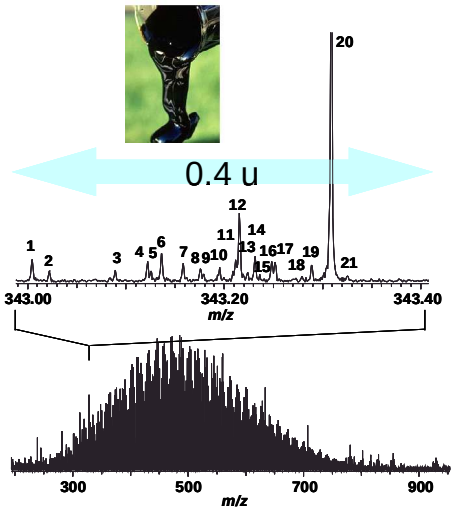
[Other references]:

In environmental analysis, complex mixture, such as river water, soil or petroleum, is often handled as a sample. These samples usually contain from sub ppm to ppb order of environmental pollutants. In order to characterize and evaluate the nano environmental pollutant contained in natural complex mixture, most of the samples require extraction, concentration, or column separation of the pollutant from the sample matrix. These multistage treatments are laborious work and lead erroneous results. High resolution mass spectrometry (MS) is one means to solve the problem lying on the environmental analysis, because it is able to separate compound in complex mixture by mass. Therefore, almost of all inventory of complex mixture can be assigned by mass without sample purification (Fig. 1). Several ionization techniques coupled with Fourier transform ion cyclotron resonance mass spectrometry (FT-ICR MS) are applied to complex mixture analysis. The obtained result, however, is insufficient for quantitative analysis because of difference in ionization efficiency of contained compounds.

Desorption ionization on silicon (DIOS) is a novel soft ionization technique whose ionization mechanism is similar to matrix assisted laser desorption ionization except for using matrix (Fig. 2). DIOS improves quantitative capability of environmental pollutants (mostly aromatic compounds) since it ionize a sample directly by laser. In this research, DIOS is coupled with FT-ICR MS and novel method of quantitative analysis for environmental nano pollutant will be established.

[key words]

environmental analysis, nano-pollutant, FT-ICR MS, DIOS



#	Exp. mass	Molecular formulae	Theoret. mass
1	343.0048	$C_{16}H_{11}N_2OS_3$	343.0028
2	343.0221	$C_{16}H_{11}N_2O_3S_2$	343.0206
3	343.0893	$C_{16}H_{23}O_2S_3$	343.0855
4	343.1221	$C_{20}H_{23}OS_2$	343.1185
5	343.1258	$C_{22}H_{19}N_2S$	343.1263
6	343.1364	$C_{17}H_{27}O_3S_2$	343.1396
7	343.1583	$C_{21}H_{27}S_2$	343.1549
8	343.1760	$C_{21}H_{27}O_2S$	343.1726
9	343.1793	$C_{23}H_{23}N_2S$	343.1805
10	343.1953	$C_{20}{}^{13}CH_{28}NOS$	343.1900
11	343.2119	$C_{19}H_{35}OS_2$	343.2124
12	343.2156	$C_{24}H_{27}N_2$	343.2169
13	343.2239	$C_{18}H_{35}N_2S_2$	343.2325
14	343.2313	$C_{21}{}^{13}CH_{32}NS$	343.2264
15	343.2363	$C_{21}H_{31}N_2O_2$	343.2380
16	343.2483	$C_{23}H_{35}S$	343.2454
17	343.2518	$C_{29}H_{39}S_2$	343.2488
18	343.2792	$C_{23}{}^{13}CH_{37}NO$	343.2824
19	343.2890	$C_{19}{}^{13}CH_{40}NO_3$	343.3035
20	343.3092	$C_{23}H_{39}N_2$	343.3108
21	343.3253	$C_{20}{}^{13}CH_{44}NS$	343.3203

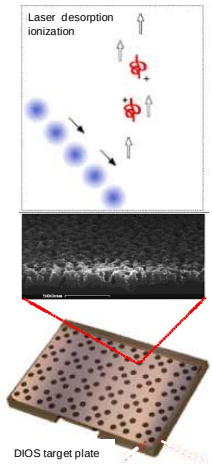


Fig. 1 Example analysis of environmental pollutants by FT-ICR MS

Fig. 2 DIOS