

HIGH PERFORMANCE LIQUID CHROMATOGRAPHY

No. L224

Analysis of Furfural
In Insulating Oil

Aged deterioration of an oil-immersed transformer is said to be resultant from the decrease of mechanical strength of the insulating paper. At present, as methods of examining the decrease of this strength, measurement of the condition of the piling of the insulating paper or measurement of gas components generated at the time of deterioration (CO and CO₂) is carried out. But for the measurement of the piling condition, it is necessary to sample the insulating paper itself, limiting the chance of measurement to the occasion of inspecting the inside

of the transformer. Measurement of CO and CO₂ may be easy, because it is possible by sampling the insulating oil any time. But as the gas components are also generated by the deterioration of the oil, as a method for evaluating the deterioration of the insulating paper itself, this method is not complete. Under the said circumstances, to make use of furfural which is a product of the deterioration of the insulating paper as the index for the evaluation of the life of the transformer has become active. Introduced here is an analysis of furfural in the insulating oil by the HPLC.

■ Analysis of Fresh Insulating Oil Spiked with Furfural

Figure 1 shows analysis of a fresh insulating oil with standard (1 ppm), and pretreated by the method as shown in Figure 2.

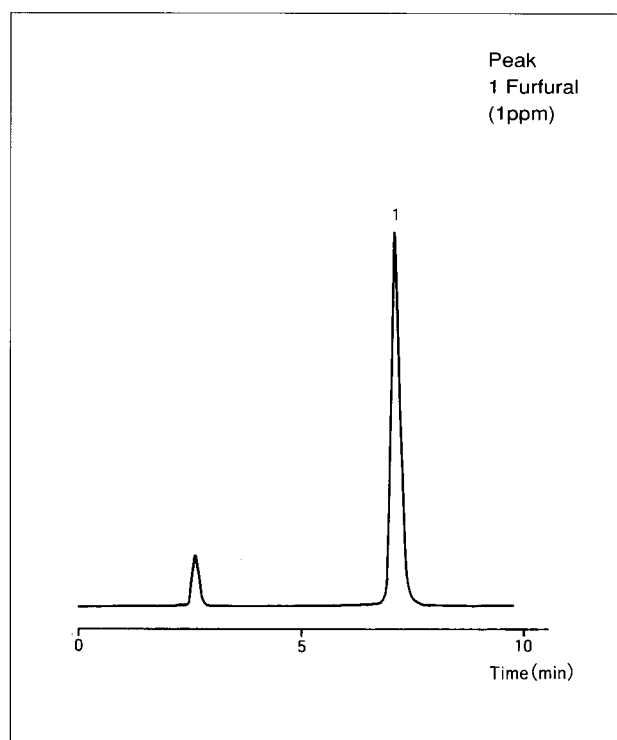


Fig.1 Chromatogram of Fresh Insulating Oil Spiked with Standard Furfural

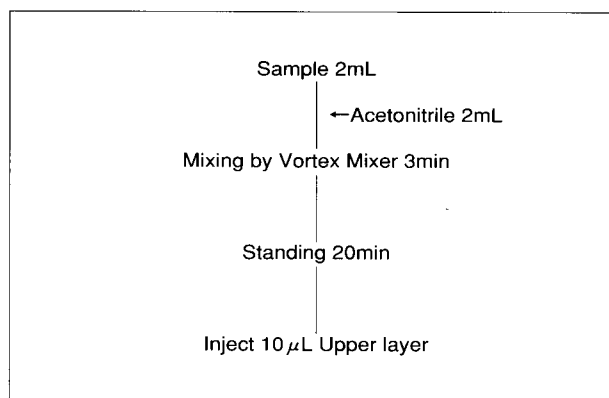


Fig.2 Pretreatment Procedure

Table 1 Analytical Conditions

Instrument	: Shimadzu LC-9A system
Colum	: Shim-pack CLC-ODS(M) (4.6mm I.D. × 15cm)
Mobile Phase	: Acetonitrile/Water=1/9(V/V)
Flow Rate	: 0.8mL/min
Temperature	: 40°C
Detector	: SPD-6A 280nm

■ Repeatability of Furfural Recovery from Insulating Oil

Table 2 shows the result of the analysis of a fresh insulating oil spiked with standard furfural (5 ppm).

Table 2 Repeatability of Furfural Recovery

n	1	2	3	4	5	mean	CV.(%)
Recovery(%)	90.7	90.3	90.5	91.3	90.3	90.6	0.46

■ Determination of Furfural in Aged Insulating Oil

Figure 3 and 4 show analysis of furfural in the insulating oil. As lot of oil remains in the sample after sample pretreatment, it is necessary to flash columns with acetonitrile, THF, etc.

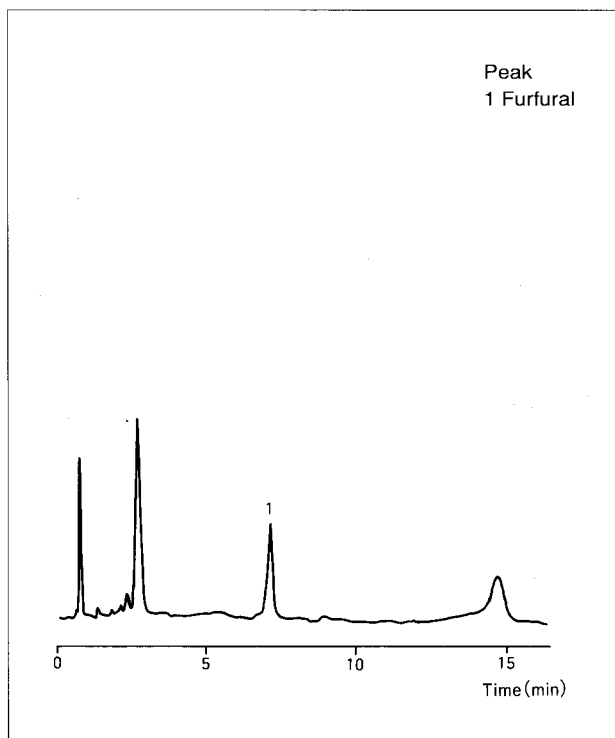


Fig.3 Chromatogram of Aged Insulating Oil A

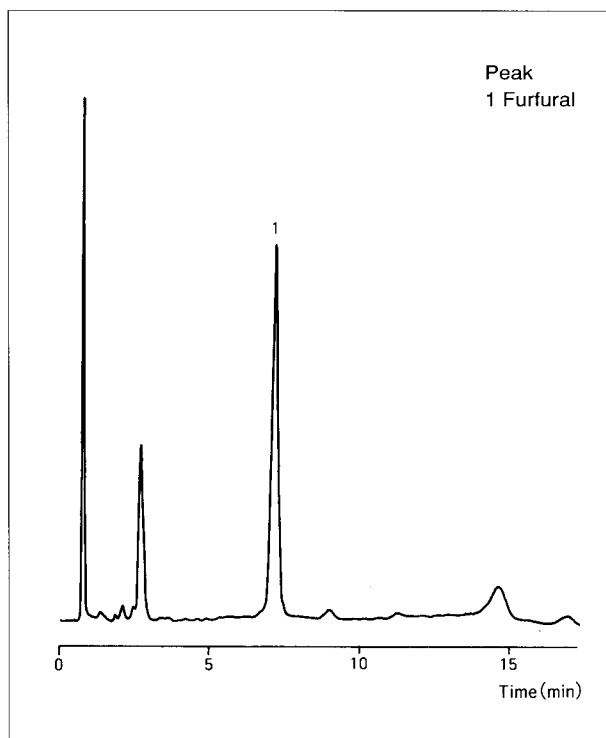


Fig.4 Chromatogram of Aged Insulating Oil B

