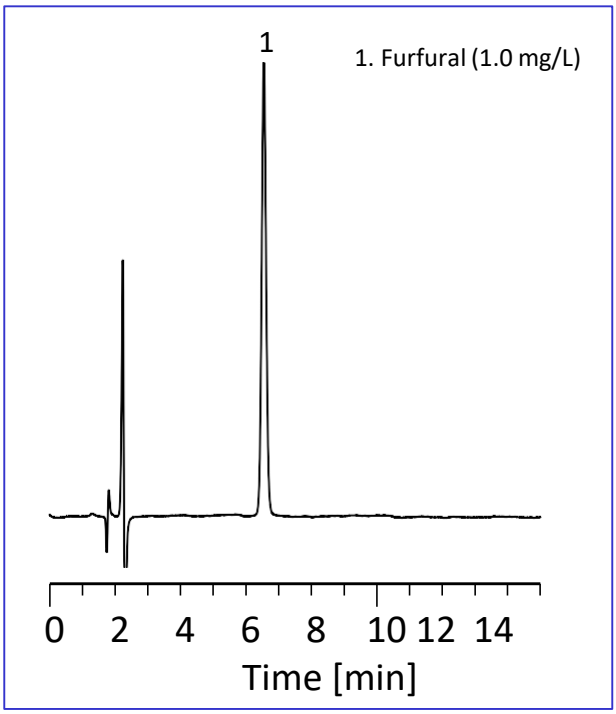
Analysis of Furfural in Insulating Oil

To check aged degradation of insulating oil, degradation product in insulating oil is often measured. Furfural is one of a degradation product of cellulose composing insulating paper in insulating oil. Furfural is stably dissolved in oil and distinction of degraded state of oil can be confirmed by measuring the concentration of furfural.

In this technical note, we introduce a HPLC method and two sample preparation methods (liquid-liquid extraction and solid phase extraction with silica gel column) for monitoring furfural in insulating oil.

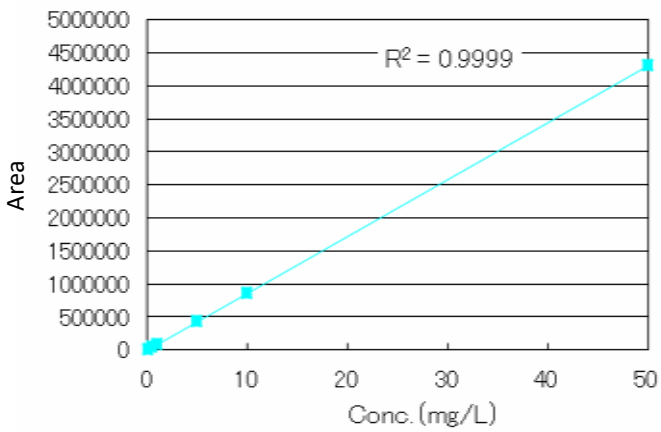
(K. Kanno)

Standard Solution



HPLC Conditions

System : LC800 UHPLC System
Column : InertSustain C18
(5 µm, 150 × 4.6 mm I.D.)
Eluent : A) H_2O
B) CH_3CN
A/B = 90/10, v/v
(Mixed by a gradient mixer)
Flow rate : 1.0 mL/min
Col. temp. : 40 ℃
Detection : UV 278 nm
Inj. vol. : 10 µL



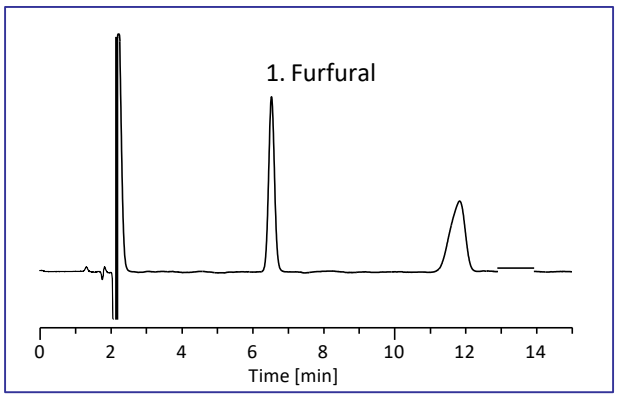
Calibration Curve

HPLC Column

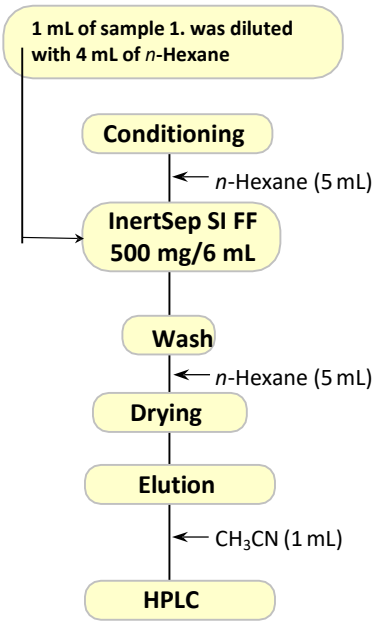
InertSustain C18 5 µm, 150 × 4.6 mm I.D.
Cat. No. 5020-07345

Sample Preparation Method Example ① (Solid phase extraction)

1. Furfural was added in fresh insulating oil as concentration of 1.0 mg/L.
2. SPE and HPLC were done five times.



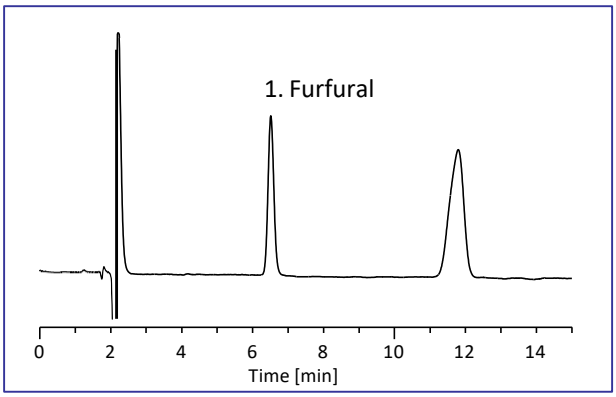
n	Recovery rate [%]
1	97.3
2	95.2
3	96.4
4	95.9
5	96.7
Average	96.3
CV [%]	0.82



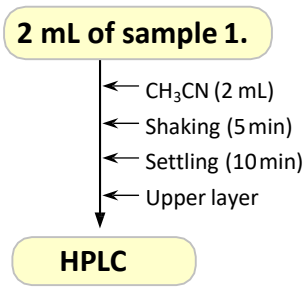
SPE Column InertSep SI FF (Fast Flow) 500 mg/6 mL
Cat. No. 5010-62344

Sample Preparation Method Example ② (Liquid-liquid extraction)

1. Furfural was added in fresh insulating oil as concentration of 1.0 mg/L (same sample of example ①).
2. Liquid-liquid extraction and HPLC were done five times.



n	Recovery rate [%]
1	86.3
2	84.8
3	87.4
4	85.0
5	85.1
Average	85.7
CV [%]	1.29



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