

**NIST No. 1083 (Wear-Metals in Lubricating Oil)**

Sheet No.: **NSX2100H-CH-001E** Petroleum chemistry  
 Measurement model: **TS-2100H System** Relevant standard: ASTM D5453  
**ABC-210/HF-210/SD-210** JIS K 2541  
 Detection method: **Ultraviolet Fluorescence method**

The sulfur in lubrication oil is added as extreme pressure agent. It needs to be managed at low concentration from a standpoint of environmental load. The sulfur analysis device (**TS-2100H**) of Mitsubishi Chemical Analytech Co., Ltd. can analyze the sulfur in lubrication oil quickly with accuracy.

Sample name	Wear-Metals in Lubricating Oil																						
Analytical item	Quantitative analysis of sulfur in combustion method																						
Standard	<b>ASTM-D5453</b> : standard testing method for measuring sulfur contained in carbon hydride and fuel using an ultraviolet fluorescence detector <b>JIS K 2541</b> : raw petroleum and petroleum product – sulfur content testing method – ultraviolet fluorescence method																						
Analytical principle	Ultraviolet fluorescence method: Sample is burned in argon / oxygen stream and the generated sulfur dioxide is introduced to the cell of ultraviolet irradiation. The fluorescence intensity generated by ultraviolet irradiation is measured and the amount of sulfur is calculated based on the standard curve that has been created using the standard sulfur sample.  $\text{Organic-S} + \text{O}_2 \rightarrow \text{SO}_2 + \text{CO}_2$ (combustion) $\text{SO}_2 + \text{h}\nu \rightarrow \text{SO}_2 + \text{h}\nu_2$ (ultraviolet fluorescence)																						
Result of sulfur analysis	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Sample name</th> <th colspan="5">TS-2100H analysis value (S µg/g)</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> <th>Average</th> <th>RSD (%)</th> </tr> </thead> <tbody> <tr> <td>Wear-Metals in Lubricating Oil</td> <td>1,017</td> <td>1,016</td> <td>1,014</td> <td><b>1,016</b></td> <td>0.15</td> </tr> </tbody> </table>						Sample name	TS-2100H analysis value (S µg/g)					1	2	3	Average	RSD (%)	Wear-Metals in Lubricating Oil	1,017	1,016	1,014	<b>1,016</b>	0.15
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Wear-Metals in Lubricating Oil	1,017	1,016	1,014	<b>1,016</b>	0.15																		
Horizontal combustion method																							
Required analysis time	Pretreatment (---) minutes, Measurement ( 9) minutes																						
Horizontal type	Total ( 9) minutes/ (1) measurement																						

\*This sheet is provided as a reference and does not guarantee analytical values. Optimal conditions may vary depending on external factors, such as the analysis environment, and the nature of the sample.

Conditions of sulfur analysis  Horizontal combustion method	<b>Measurement condition</b> Reaction tube... double tube for ABC Temperature of electric furnace Inlet Temp 900°C Outlet Temp 900°C PMT Range Low (for High concentration)		<b>Gas flow rate</b> Ar ..... 300mL/min O <sub>2</sub> ..... 300mL/min																										
	<b>[ABC program]</b> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Sample name</th> <th colspan="2">1st</th> <th colspan="2">2nd</th> <th colspan="2">3rd</th> <th rowspan="2">End Time (sec)</th> <th rowspan="2">Cool Time (sec)</th> <th rowspan="2">Delay Time (sec)</th> </tr> <tr> <th>Pos (mm)</th> <th>Time (sec)</th> <th>Pos (mm)</th> <th>Time (sec)</th> <th>Pos (mm)</th> <th>Time (sec)</th> </tr> </thead> <tbody> <tr> <td>Lubrication oil</td> <td>75</td> <td>10</td> <td>95</td> <td>120</td> <td>105</td> <td>20</td> <td>100</td> <td>60</td> <td>180</td> </tr> </tbody> </table> <p>Boat Speed: 20mm/sec      Ar Time: 10sec      O<sub>2</sub> Time (sec): 600sec</p> <p>Standard sample for standard curve: S_Dibutyl disulfide / toluene                  0, 5, 50, 250µg/mL × 40µL</p> <p>Amount of introduced sample: 20µL</p> <p>- For the sample for measurement, the sample diluted to 10% with toluene was used. The obtained measurement value multiplied by dilution rate was set to the sulfur quantitative value.</p>				Sample name	1st		2nd		3rd		End Time (sec)	Cool Time (sec)	Delay Time (sec)	Pos (mm)	Time (sec)	Pos (mm)	Time (sec)	Pos (mm)	Time (sec)	Lubrication oil	75	10	95	120	105	20	100	60
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