

# DIN 51451:2024-03 (E)

## Testing of petroleum products and related products - Analysis by infrared spectrometry - General working principles

---

<b>Contents</b>		<b>Page</b>
Foreword .....		4
1	Scope .....	5
2	Normative references .....	5
3	Terms and definitions .....	5
4	General .....	5
4.1	Theoretical principles .....	5
4.2	Units .....	7
5	Apparatus .....	7
5.1	IR spectrometer .....	7
5.1.1	General .....	7
5.1.2	Minimum requirements .....	7
5.2	Cuvettes .....	8
5.3	ATR (Attenuated Total Reflection) accessories .....	9
5.4	Other apparatus and tools .....	10
6	Reagents and equipment .....	10
7	Sample preparation .....	11
8	Preparation for measurement .....	11
8.1	Instrument checking and adjustment .....	11
8.1.1	Spectrometer .....	11
8.1.2	Recording a test spectrum .....	12
8.1.3	Determination of the instrument factor F .....	12
8.2	Path length measurement .....	13
9	Procedure .....	14
9.1	General .....	14
9.2	Spectral recording .....	14
9.3	Direct measurement .....	14
9.4	Differential spectrometry .....	14
9.5	Suspension procedure .....	14
9.6	KBr pressing procedure .....	15
10	Evaluation .....	15
10.1	Qualitative analysis .....	15
10.2	Quantitative analysis .....	15
10.2.1	General .....	15
10.2.2	Baseline method .....	15
10.2.3	Reference graph method .....	16
10.2.4	Standard addition method .....	17
11	Expression of results .....	17
12	Precision .....	17

<b>Annex A (informative) Infrared spectrometers .....</b>	<b>18</b>
<b>A.1 Fourier transform infrared spectrometers (FT-IR spectrometers) .....</b>	<b>18</b>
<b>A.2 Attenuated Total Reflection (ATR) accessories .....</b>	<b>18</b>
<b>Bibliography .....</b>	<b>20</b>
<b>Figures Figure 1 -- Representation of a mean infrared transmission spectrum for ca. 40 µm thick polystyrene film in the range of 4 000 cm<sup>-1</sup> to 400 cm<sup>-1</sup> .....</b>	<b>11</b>
<b>Figure 2 -- Example of a transmittance spectrum for polypropylene film with interference pattern for path length determination .....</b>	<b>13</b>
<b>Figure 3 -- Baseline method (linear absorbance ordinate) with two signals as examples .....</b>	<b>16</b>
<b>Figure A.1 -- Essential parts of an FT-IR spectrometer .....</b>	<b>18</b>
<b>Figure A.2 -- Essential parts of an ATR accessory for IR spectrometry .....</b>	<b>19</b>
<b>Tables Table 1 -- Common window materials .....</b>	<b>9</b>
<b>Table 2 -- Window materials commonly used in ATR technology .....</b>	<b>9</b>
<b>Table 3 -- Absorption for determining the instrument factor F .....</b>	<b>12</b>
<b>Table 4 -- Measurement ranges for path length measurement .....</b>	<b>13</b>