

# Substance Scheme

## ThermoTireOil RR

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Product name: ThermoTireOil RR  
 Precursor: Tyre rubber  
 Production process: Pyrum-Thermolysis

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<b>Dok.-No.</b>	902	<b>Version</b>	9
<b>Page count</b>	12	© 2018 Pyrum Innovations AG	
<b>Revision index</b>	<b>Date</b>	<b>Description</b>	
Version 1	05.07.2017	First draft of substance scheme	
Version 2	18.07.2017	New Logo	
Version 3	25.09.2017	Update	
Version 4	04.02.2019	Update	
Version 5	17.07.2019	Update	
Version 6	12.02.2020	Update	
Version 7	27.02.2020	Update PAH	
Version 8	12.03.2020	Update H+P statements	
Version 9	21.09.2020	Update Format	

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## Thermolysis Oil



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### 1 Safety information

Table 1: Relevant hazard notes for packaging and safety data sheet according to GHS

H225	H315; H319; H332	H304; H340; H350; H361d; H372, H373	H411
GHS02	GHS07	GHS08	GHS09
Signal word: Danger			

#### 1.1 H-Phrases

H225	Highly flammable liquid and vapour.
H226	Flammable liquid and vapour.
H228	Flammable solid.
H302	Harmful if swallowed.
H304	May be fatal if swallowed and enters airways
H312	Harmful in contact with skin.
H312+H332	Harmful in contact.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H335	May cause drowsiness and dizziness.
H340	Suspected of causing genetic defects.
H350	May cause cancer.
H351	Suspected of causing cancer.
H361d	Suspected of damaging fertility of the unborn child.

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H372	Causes damage to the hearing organs through pronolaged or repeated exposure
H373	May cause damage to the central nervous system and the hearing organs through prolonged or repeated exposure. Route of exposure: Inhalation.
H400	Very toxic to aquatic life with long lasting effects.
H411	Toxic to aquatic life with long lasting effects.
H412	Harmful to aquatic life with long lasting effects.

### 1.2 P-Phrases

P201	Obtain special instructions before use.
P210	Keep away from heat, hot surfaces, sparks, open flames and other ignition soureces. No smoking.
P241	Use explosion-proof electrical/ventilation/lighting equipment.
P261	Avoid breathing dust/fume/gas/mist/vapours/spray.
P273	Avoid release tot he environment.
P280	Wear protective gloves/protective clothing/eye protection/face protection/ hearing protection
P301+P310	IF SWALLOWED: Call a POISON CENTER/doctor.
P303+P361+P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower
P305+351+P338	IF IN EYES: Rinse cautiously with water for serveral minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P330	Rinse mouth.
P331	Do NOT induce vomitting.
P403+P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/container in accordance with local/regional/national/international regulations

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Table 2: Recommended personal protection equipment



			
PPE - long clothing	Safety shoes	Safety goggles	Resistant gloves

Table 3: Relevant warning signals and prohibitions for technical applications

			
Toxic	Danger of explosive atmosphere	No open flames	Do not extinguish with water

### 1.3 Transport

**Dangerous goods ADR/RID/AND**

UN1993 FLAMMABLE LIQUID, N.O.S. (BENZENE, TOLUENE), ENVIRONMENTALLY HAZARDOUS

**IMDG, IATA**

FLAMMABLE LIQUID, N.O.S. (BENZENE, TOLUENE), MARINE POLLUTANT

All safety information is based on experience and is merely intended to assist and sensitize the user. It does not replace the user's risk and danger assessment in any way.

## 2 Physical properties

state of aggregation:	liquid (under atmospheric conditions)		
colour:	brown-yellow		
pH-Wert:	7,5 - 9		DIN 38404C5
density (20°C):	900 - 950	kg/m <sup>3</sup>	DIN EN ISO 3838

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gross calorific value:	39 – 42,5	MJ/kg	DIN EN 15400
kin. viscosity at 40 °C:	< 2,0	mm <sup>2</sup> /s	EN ISO 3104
dyn. viscosity at 40 °C:	< 1,5	mPas	DIN EN ISO 2555 rheologisch
flash point:	< 5	°C	DIN EN ISO 3679
Ignition temperature:	> 200	°C	(estimated value)
Boiling range	36 - 560	°C	ASTM D2887 Extended

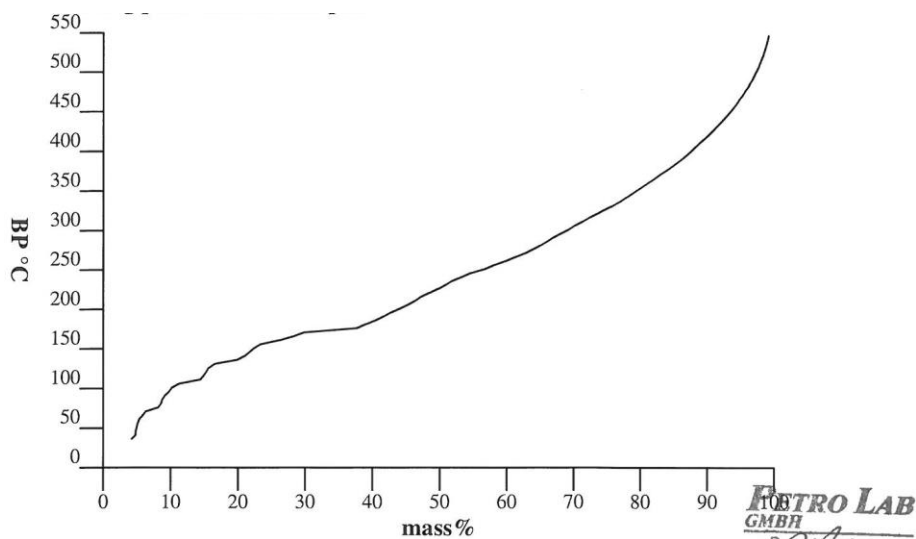


Figure 1: Boiling point distribution by simulated distillation in accordance with ASTM D2887 Ext.

The proportions of the boiling fractions are shown in Figure 1.

### 3 Chemical properties

- Corrosive towards non-passified steel
- Dissolves polystyrene
- Expands many plastics

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### 4 IR-Spectroscopy

#### 4.1 Method description

The qualitative IR analysis was carried out via (ATR) IR spectroscopy.

Spectrometer: Alpha with sample compartment RT-DLaTGS, Bruker  
Accessory: ATR platinum Diamond 1 Refl  
Software: OPUS 7.5

#### 4.2 Results

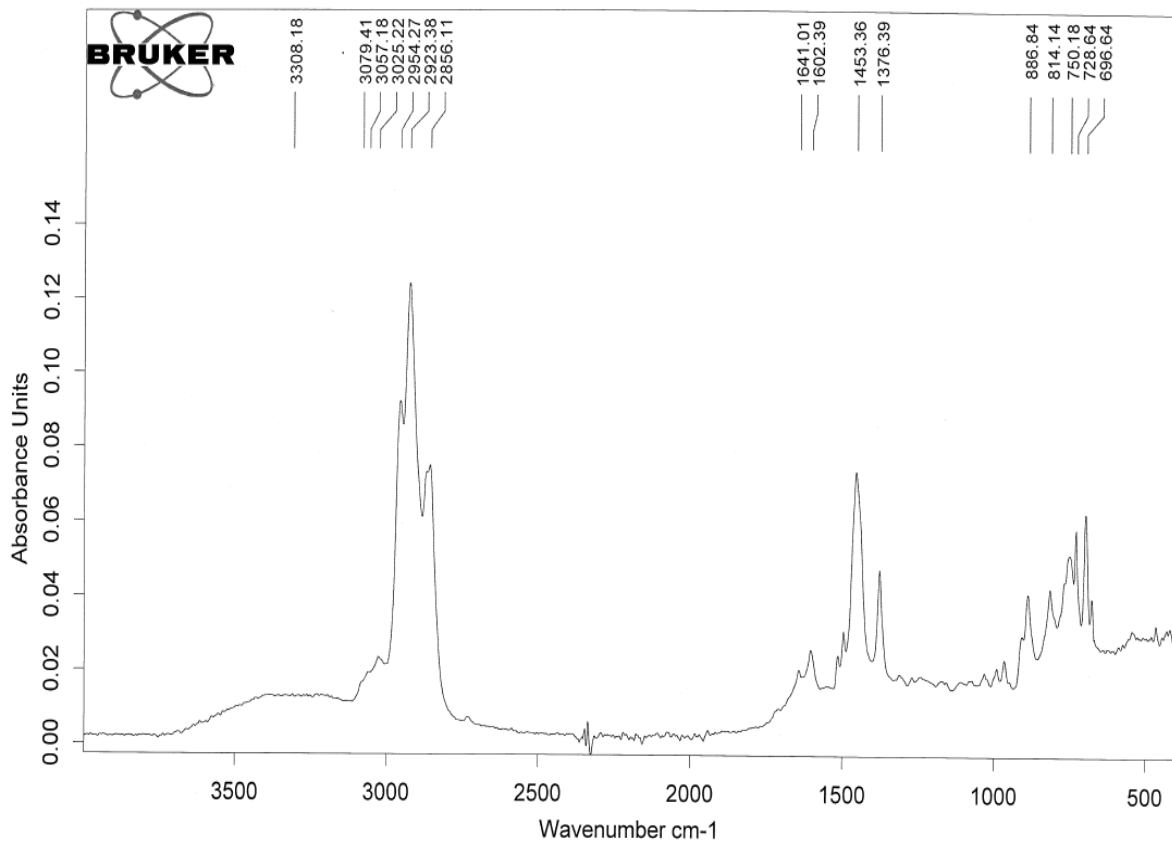


Figure 2: IR-spectrum of the pyrolysis oil

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Table 4: Typical bands of the pyrolysis oil

Wavenumber (cm <sup>-1</sup> )	Structural unit
3057.18	=C-H (Stretching, Olefine)
3025.22	=C-H (Stretching, Aromaten)
2954.27	CH <sub>3</sub> (Stretching)
2923.38	CH <sub>2</sub> (Stretching)
2856.11	CH (Stretching)
1641.01	C=C (Stretching, Olefine)
1602.39	C=C (Stretching, Aromaten)
1453.36	CH <sub>3</sub> , CH <sub>2</sub> , CH (Bending)
1376.39	CH <sub>3</sub> (Bending)
990-660	=C-H (Bending, Olefine)
900-600	C-H (Bending, Aromaten)

The IR spectrum showed the expected absorptions according to the sample composition. Both aromatics and saturated and unsaturated aliphatic hydrocarbons were detected.

Table 5: Experience based values for the chemical stability of chosen substances toward thermolysis oil; good chem. stability (+); moderate chem. stability (o); low to no chem. stability (-)

Material	Stability	Long term stability
Stainless steel: 1.4571, 1.4828, or similar	+	affirmative
Graphite (e.g. in flat gasket)	+	affirmative
NBR	-	
Polystyrene	-	
Oxime-silicone	o	n.e.
PTFE	+	affirmative
Copper	+	affirmative
S235JR (construction steel)	-	Prone to corrosion



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### 5 Physiological properties

Odour: sent of mineral oil, sulfidic

Toxicity: see table 1 and chapter 8

### 6 Composition

#### 6.1 Components

Table 6: Components of the oil

Components	Substance group
Aromatics Hydrocarbons	Mono-aromatics
	Di-aromatics
	Tri+-aromatics
	Polyaromatics
Non aromatics Hydrocarbons	Paraffins
	Mono-Naphtenics
	Di-Naphtenics
	Cycloalkenes
	Others

#### 6.1.1 Single Components

Table 7 Mono Aromatics

Substance	DIN Norm
Benzene	DIN EN ISO 22155
Toluene	DIN EN ISO 22155
Ethylbenzene	DIN EN ISO 22155
Xylene	DIN EN ISO 22155
Styrene	DIN EN ISO 22155

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The biggest parts of the oil are aromatic compounds, olefins and paraffins. The chain length proportions were shown in figure 9.

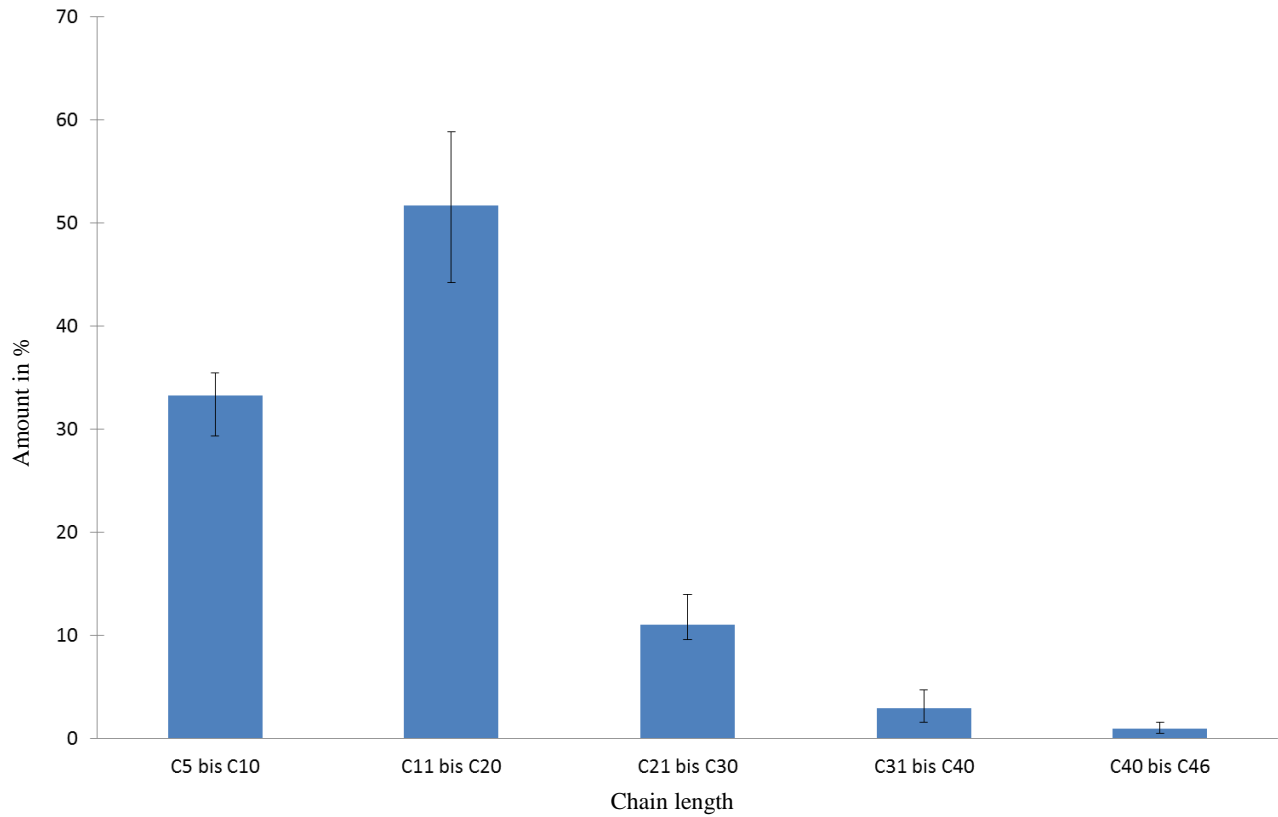


Figure 9: Content depending on the chain length

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Table 8 Polycyclic aromatic hydrocarbons (PAH)

Substanz	Norm
Napthaline	DIN 38407-F39
Acenaphthylene	DIN 38407-F39
Acenaphthene	DIN 38407-F39
Fluorene	DIN 38407-F39
Phenanthrene	DIN 38407-F39
Anthracene	DIN 38407-F39
Fluoranthene	DIN 38407-F39
Pyrene	DIN 38407-F39
Benzo(a)anthracene	DIN 38407-F39
Chrysene	DIN 38407-F39
Benzo(b)fluoranthene	DIN 38407-F39
Benzo(k)fluoranthene	DIN 38407-F39
Benzo(a)pyrene	DIN 38407-F39
Indeno(1, 2, 3-c, d)pyrene	DIN 38407-F39
Dibenzo(a, h)anthracene	DIN 38407-F39
Benzo(g, h, i)perylene	DIN 38407-F39

## 6.2 Nuclear composition

Table 9 Composition

Element	Content	Analysis
C	> 80%	Elementary analysis
H	< 10%	Elementary analysis
N	< 1%	Elementary analysis
S	< 1%	Elementary analysis
Cl	< 10mg/kg	Altöl Anlage 2 Nr. 3

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### 6.3 Impurity

Water:	< 0,1 %	DIN EN ISO 12937
Carbon Black:	< 0,1g/l	DIN EN 12662

## 7 Examples for application

- Fuel for asphalt burner
- Crude oil supplement for usage in refineries
- Fuel in general for generation of energy