“Detailed Mid-FTIR Analysis Of Gasoline, Diesel & Jet Fuel With A Single Portable Analyzer In Seconds”

Philipp Jordan
Welcome to a new era of petroleum testing

PERFORMANCE YOU CAN RELY ON

eralytics™ GmbH

www.eralytics.com
Profile

- Development
- Production
- Sales
- After-Sales Service

of innovative, reliable and easy to operate petroleum testing equipment.
Experience you can rely on

- Eralytics founded in May 2007 by 4 industry insiders
- Several hundred installations in > 50 countries
- World-wide sales & service network – North America: COMPASS INSTRUMENTS
Mission

Add value for our customers by enhancing their ability to perform reliable measurements with

- highest precision
- maximum speed
- easiest operation
Quality you can rely on

- eralytics is ISO 9001:2008 certified since Jan 2008
- ISO 9001:2008 certificate from DET NORSKE VERITAS
Product range

• **ERAVAP** - vapor pressure tester of gasoline, crude oil & LPG
• **ERASPEC** - mid-FTIR fuel analyzer for gasoline, diesel, FAME & jet fuel
• **ERACHECK** - hydrocarbons in water tester
Tomorrow Papers

- **ERAVAP** - vapor pressure tester of gasoline, crude oil & LPG
  “Vapor Pressure Measurement Of Gasoline, Crude Oil & LPG With New ASTM D5191 & D5188 Speed Test” –
  Fuel Ratings Symposium / Vine I & II at 10:30

- **ERACHECK** - hydrocarbons in water tester
  “Oil/Grease In (Sea) Water – Portable & CFC-Free A New Mid-IR Laser Based Analyzer for Total Petroleum Hydrocarbons in Water” –
  Gulf Oil Spill Symposium / Bluebonnet at 10:00
Welcome to a new era of petroleum testing

ERASPEC

Detailed Mid-FTIR Analysis Of Gasoline, Diesel & Jet Fuel With A Single Portable Analyzer In Seconds

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IR Spectrometry

Dispersive Element:
Separation of different wavelengths of the IR-radiation => Measurement of intensity as a function of wavelength: SPECTRUM

In ERASPEC: FTIR Interferometer (FT = Fourier Transformation)
IR Spectrometry

Spectrum of gasoline $I_g(v); \quad v = 1/\lambda$
IR Spectrometry

Spectra of gasoline, reference: $I_g(v)$, $I_r(v)$
IR Spectrometry

Transmission spectrum $T(\nu) = 100 \frac{I_g}{I_r}$
IR Spectrometry

Absorbance spectrum $A(v) = \log(I_r/I_g)$
IR Spectrometry

Absorbance spectrum:

Absorbance is directly proportional to the concentration of the substance that causes the absorption line.

[Graph showing absorbance spectrum with wavenumber (cm⁻¹) on the x-axis and absorbance (absorbance units) on the y-axis.]
IR Spectrometry

Compositional analysis

• Pure chemicals are measured by analyzing IR peaks associated with each substance

• The height of or area under a peak is proportional to the concentration of the respective substance
IR Spectrometry

Mixture of Benzene and Ethanol
ERASPEC

Excellent precision for gasoline composition

- Total Oxygen, Oxygenates, Aromatics, Olefins, Saturates, Di-Olefins

- 16 Aromatics incl. Benzene (ASTM D 6277, EN 238), Toluene, o-, p- & m-Xylene, Ethylbenzene, etc.
ERASPEC

Excellent precision for gasoline composition

• 9 Oxygenates (ASTM D 5845)
• Alcohols (Methanol, Ethanol, Iso-Propanol, etc.)
• Ethers (MTBE, ETBE, TAME, DIPE)
• N-Methylanilin, MMT, CMT
ERASPEC
Excellent precision for Diesel composition

• Total Aromatics
• PNA
• FAME (Biodiesel) (EN 14078)
• Cetane Improver (2-EHN)
ERASPEC
ES01-JET for Jet fuel parameters in 1 minute

## JET FUEL ANALYSIS WITH MODULE EV01-JET

<table>
<thead>
<tr>
<th>PARAMETERS</th>
<th>RANGE</th>
<th>REPEATABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Aromatics</td>
<td>0 – 60 VOL%</td>
<td>0.45 VOL%</td>
</tr>
<tr>
<td>FAME concentration</td>
<td>0.08 – 6 VOL%</td>
<td>0.01 VOL%</td>
</tr>
<tr>
<td>Polynuclear Aromatics (PNA)</td>
<td>0.25 – 10 VOL%</td>
<td>0.08 VOL%</td>
</tr>
</tbody>
</table>
ERASPEC
Excellent precision for important fuel properties

- RON, MON & AKI
- Cetane Number
- Cetane Index
- Distillation points (IBP, T10, T50, T90, T95, FBP)
- Evaporation points (E70, E100, E150, E250, E350)
- RVP
- 10 freely programmable parameters
# ERASPEC

**ES01-JET** for Jet fuel parameters in 1 minute

<table>
<thead>
<tr>
<th>PROPERTIES</th>
<th>REPEATABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freezing Point</td>
<td>0.8°C</td>
</tr>
<tr>
<td>Flash Point</td>
<td>0.8°C</td>
</tr>
<tr>
<td>Smoke Point</td>
<td>0.2 MM</td>
</tr>
<tr>
<td>Viscosity @ 20°C</td>
<td>0.03 MPAS</td>
</tr>
<tr>
<td>Viscosity @ -20°C</td>
<td>0.11 MPAS</td>
</tr>
<tr>
<td>Distillation fractions</td>
<td>2.6°C</td>
</tr>
<tr>
<td>Density</td>
<td>0.0006 GCM⁻³</td>
</tr>
</tbody>
</table>

10 freely programmable properties

*) The range and repeatability for all determined properties depend on the database used!
ERASPEC
Excellent precision for important fuel properties

- **Density**: direct measurement with built-in Anton Paar density meter
- **Accuracy**: 0.0005 g/cm³
ERASPEC
Measuring principle to determine fuel properties

Calculation methods:

- **Cluster Analysis**
  - Maximum Accuracy
  - Calibration data base with similar samples required

- **Multi Linear Regression (MLR)**
  - Method if Cluster Analysis is not applicable

The applied calculation method is shown with the result
ERASPEC

Calculation of fuel properties (RON, MON, Cetane number & Index, Distillation etc):

- Data base (library) containing fuels with known properties, easy to upgrade
- Factory calibration data base of a matrix of several hundred international fuels
- Spectral regions that correlate with fuel properties
ERASPEC
performance you can rely on

Latest technology for reliable operation:

• Industrial PC
• Linux system
• Universal input power supply (85-264V)

=> No influence of voltage fluctuations
ERASPEC

• Multiple connections for easy data management

USB, Ethernet and RS232 connection for printer, computer, barcode reader, mouse, keyboard, LAN, and LIMS
ERASPEC
Latest Technology

High-Speed Testing

• Warm-up time: 30 seconds
• Measuring time: 60 seconds

No sample preparation, automatic sample introduction, automatic cleaning!
ERASPEC
Easiest Operation

• Fully automated measurement
• Detailed results in only 1 minute
• Results can be analyzed, printed, saved to USB-stick, transferred to LIMS
ERASPEC
Analysis of Fuel Spectra

Fuel Spectra as Grafic Chart on Display
• View Spectra
• Compare Spectra
• Analyze Spectra

→ No PC needed!
→ No external software!
ERASPEC

Portable & Rugged

- Small footprint
- Light weight (7 kg)
- Metal Housing

→ The perfect solution for mobile testing!
ERASPEC
Latest Technology

Auto Sampler
• 10 positions
• Directly attached
• Tubes or syringes

→ ERASPEC remains fully portable!
ERASPEC

- ERASOFT RCS PC software
  - Remote control (several analyzers)
  - Data transfer
  - Result view, print, storage
ERASPEC

• Free Software upgrade: simply with USB stick or Erasoft RCS
ERASPEC Applications

- Production / blending control in refineries
- Product monitoring at pipeline terminals
- Blending of bio fuels
- Product specification testing in fuel distribution like storage tanks, trucks, ships, etc.
- Quality control of Jet fuel at airports
ERASPEC
Applications

- Mobile testing to fight fuel adulteration, smuggling and dilution
- R&D at car manufacturers
- Universities
- Product specification control in motor racing

Several hundred international installations:
EPA, Shell, Sinopec, Petrochina, Intertek, OMV, SGS, Teppco, NIOC, OilLybia, MOL, Caltex, ….
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THANK YOU FOR YOUR ATTENTION!

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