









Measurements of dark and black samples with photoacoustic spectroscopy



- Photoacoustic spectroscopy suits extremely well for the measurement of dark samples that have low transmittance or reflectivity on a wide spectral range
- The reason for this is that the photoacoustics is a direct absorption measurement technique – the higher the absorbance the higher the signal is
- With other techniques (transmission, ATR, DRIFT) proper spectra are difficult to obtain from dark samples due to the high absorption
- With the PA301 accessory no sample preparation is needed and contaminated sample cups can be discarded after use





Bitumen



Parameters:

Sample: Bitumen

Measurement time: 250 seconds (100 scans)

FTIR device: Thermo Antaris

Resolution: 8 cm⁻¹

HeNe laser frequency: 2.5 kHz

Atmosphere: Helium

Pressure: 1 atm







Heavy oil





v [cm⁻¹]









	05					
	0.5		1	Ι	1 1	
Parameters:	0.45	_				
Sample: Asphalt						
Measurement time: 100 seconds (20 scans)	0.4	_				1
FTIR device: Thermo Antaris	<u>e</u> 0.35	-				
Resolution: 4 cm ⁻¹	l sig					
HeNe laser frequency: 2.5 kHz	<u>50</u> 0.3	_				Λ
Atmosphere: Helium	rma			A		W
Pressure: 1 atm	₽ ^{0.25}	_	ł		\wedge	
	0.0			V	JV	
	0/					

0.15

0.1

ν [cm⁻¹]





Parameters:

Sample: Resin Measurement time: 100 seconds (20 scans)

FTIR device: Thermo Antaris

Resolution: 4 cm⁻¹

HeNe laser frequency: 2.5 kHz

Atmosphere: Helium

Pressure: 1 atm















v [cm⁻¹]

		0.22		1	1	1	1	Ι	I	
Parameters:										Λ
Sample: Coal		0.2	-							
Measurement time: 25 seconds (10 scans)		0.18	_							
FTIR device: Thermo Antaris								Δ.	٨	1
Resolution: 8 cm ⁻¹	gnal	0.16	-					NN	\sim \sim	
HeNe laser frequency: 2.5 kHz	d si							//	N	
Atmosphere: Helium	alize	0.14	-						V	
Pressure: 1 atm	Norm	0.12	_		\searrow					
		0.1	-			`				
		0.08		I						_
		0.06	4000	3500	3000	2500	2000	1500	1000	500



Black powder in fireworks (mix)



Parameters:

Sample: **Black powder in fireworks mix** Measurement time: **25 seconds (10 scans)** FTIR device: Thermo Antaris Resolution: 8 cm⁻¹ HeNe laser frequency: 2.5 kHz Atmosphere: Helium Pressure: 1 atm







Dust from process



Parameters: Sample: Dust from process Measurement time: 25 seconds (10 scans) FTIR device: Thermo Antaris Resolution: 8 cm⁻¹ HeNe laser frequency: 2.5 kHz Atmosphere: Helium Pressure: 1 atm











Parameters: Sample: PEB asphaltene Measurement time: 25 seconds (10 scans) FTIR device: Thermo Antaris Resolution: 8 cm⁻¹ HeNe laser frequency: 2.5 kHz Atmosphere: Helium Pressure: 1 atm







Sediment from condenser



Parameters: Sample: Sediment from condenser Measurement time: 25 seconds (10 scans) FTIR device: Thermo Antaris Resolution: 8 cm⁻¹ HeNe laser frequency: 2.5 kHz Atmosphere: Helium Pressure: 1 atm







Sediment from the mixer



Parameters: 0.14 Sample: Sediment from mixer 0.12 Measurement time: 25 seconds (10 scans) 0.12 FTIR device: Thermo Antaris 0.1 Resolution: 8 cm⁻¹ 0.08 HeNe laser frequency: 2.5 kHz 0.08 Atmosphere: Helium 0.06 Pressure: 1 atm 0.06







Carbonaceous mesophase



Parameters:	
Sample: Carbonaceous mesophase from condenser	
Measurement time: 25 seconds (10 scans)	_
FTIR device: Thermo Antaris	iana
Resolution: 8 cm ⁻¹	tic s
HeNe laser frequency: 2.5 kHz	snoc
Atmosphere: Helium	toac
Pressure: 1 atm	Pho



