



General information	
Type of data	Emissions testing
Place of experimentation	Delhi (India)
Dates of the experiments	2018
Feedstock	
Type of faecal material	Fresh faecal waste
Location of collection	Coimbatore, India
Age before collection	1-3 days
Moisture content	N/A
Total solids content	N/A
Volatile solids content	N/A
Ash content	N/A
Presence of trash?	No
Pre-treatment	N/A
Experimental Procedure	
Drying experimental setup	A custom-designed dryer connected to an exhaust system
Holding or residence time	8 hours
Operating conditions	80°C
Sample form in the dryer	Sample produced by a jerky gun
Analysed parameters	ISO 30500 air stack parameters
Employed method	<p>Gas analysis through the ISO 30500 sampling trains</p> <p>Sampling from exhaust pipe and work zone: a nozzle, followed by a thimble filter, sampling probe, sampling kit containing gas specific absorbing solutions for SO₂, H₂S, NH₃, VOC, PAH, and gas meter measuring CO, CO₂, NO_x, and O₂, exit via vacuum pump.</p> <p>PM_{2.5}: cyclonic setup containing a nozzle at one end, connected to a probe at the other end; a 40 mm glass fibre</p>

	filter to collect particles smaller than 2.5 micron in diameter, then weighed to determine PM2.5 particles in the exhaust air															
Publications																
-																
Data source files																
https://www.dropbox.com/s/xq4lwro9hciv40v/Gas%20emissions%20testing_TUV%20Noida_India%20%282018%29.xlsx?dl=0																
Additional Notes																
<ul style="list-style-type: none">○ Tests performed to validate testing methods of the ISO 30500 standard○ During first 4 days of drying, gas emissions measured from a sampling port in the exhaust pipeline (photo A).○ During 5th day of operation, gas emissions measured near the exhaust hood of the dryer (photo B).○ 2 drying processes per day.																
<div><p>A</p></div>	<div><p>B</p></div>															
Description of Data																
Gas emissions from sampling in the exhaust pipeline (n=8)																
<table><tr><th>Parameter</th><th>CO</th><th>NO_x: NO+NO₂</th><th>H₂S</th><th>VOC (benzene)</th></tr><tr><td>Stack Results (mg/Nm³)</td><td>BDL (DL:1.0)</td><td>BDL (DL:1.0)</td><td>BDL (DL:0.1)</td><td>BDL (DL:0.5)</td></tr><tr><td>Standard Deviation (mg/Nm³)</td><td>BDL (DL:1.0)</td><td>BDL (DL:1.0)</td><td>BDL (DL:0.1)</td><td>BDL (DL:0.5)</td></tr></table>	Parameter	CO	NO _x : NO+NO ₂	H ₂ S	VOC (benzene)	Stack Results (mg/Nm ³)	BDL (DL:1.0)	BDL (DL:1.0)	BDL (DL:0.1)	BDL (DL:0.5)	Standard Deviation (mg/Nm ³)	BDL (DL:1.0)	BDL (DL:1.0)	BDL (DL:0.1)	BDL (DL:0.5)	<div>Observations<ul style="list-style-type: none">○ Lower concentration of the compounds measured from the pipe line (probable because dilution with air)○ Compounds detected during drying: CO, NO_x, SO₂, NH₃, particles PM_{2.5}</div>
Parameter	CO	NO _x : NO+NO ₂	H ₂ S	VOC (benzene)												
Stack Results (mg/Nm ³)	BDL (DL:1.0)	BDL (DL:1.0)	BDL (DL:0.1)	BDL (DL:0.5)												
Standard Deviation (mg/Nm ³)	BDL (DL:1.0)	BDL (DL:1.0)	BDL (DL:0.1)	BDL (DL:0.5)												

Parameter	SO ₂	PM _{2.5}	NH ₃	PAH
Stack Results (mg/Nm ³)	10	BDL (DL:1.0)	BDL (DL:0.1)	BDL (DL:0.0001)
Standard Deviation (mg/Nm ³)	5.9	BDL (DL:1.0)	BDL (DL:0.1)	BDL (DL:0.0001)

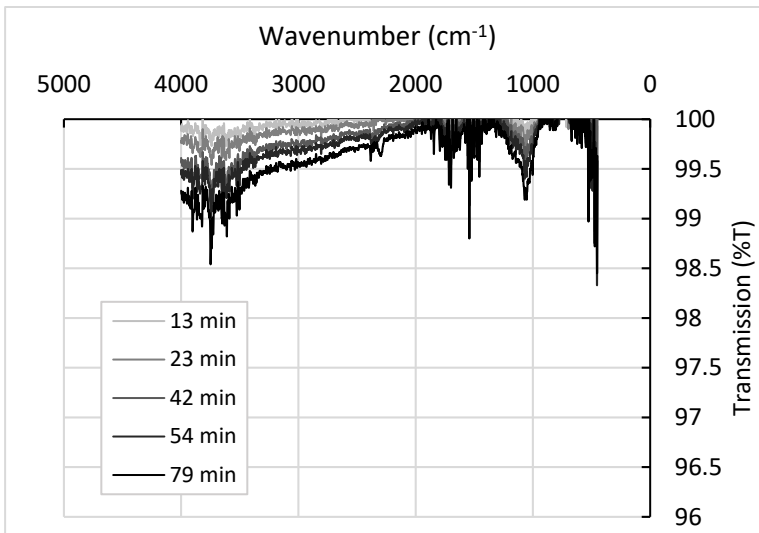
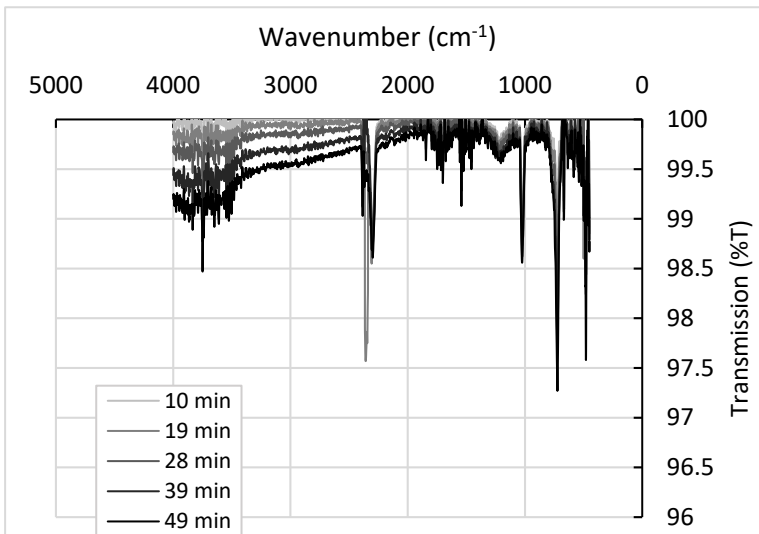
*BDL: below detectable limit

Gas emissions from sampling near the exhaust hood (n=2)

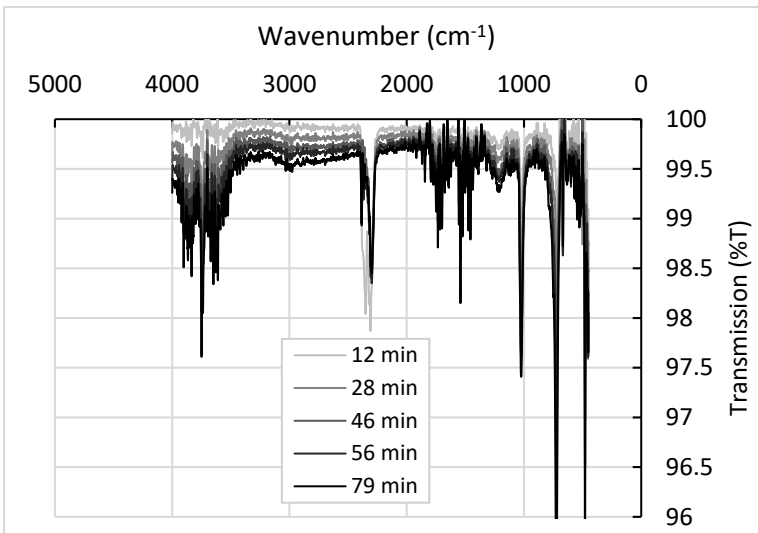
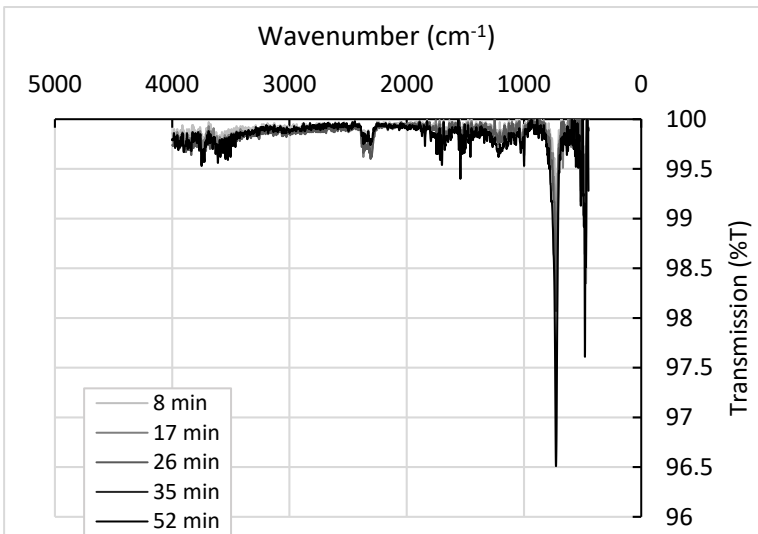
Parameter	CO	NO _x (NO+NO ₂)	H ₂ S	VOC
Average (mg/m ³)	1.145	14.1	BDL (DL:0.1)	BDL (DL:0.5)
S.D. (mg/m ³)	0.810	3.960	BDL (DL:0.1)	BDL (DL:0.5)
Range (LL –HL) mg/m ³	0.335 – 0.955	10.14 – 18.06	BDL (DL:0.1)	BDL (DL:0.5)

Parameter	SO ₂	PM _{2.5}	NH ₃	PAH
Average (mg/m ³)	2.85	16.5	0.0031	BDL(DL:0.0001)
S.D. (mg/m ³)	0.354	2.121	0.001	BDL(DL:0.0001)
Range (LL – HL) mg/m ³	2.49 – 3.2	14.37 – 18.62	0.003 – 0.004	BDL(DL:0.0001)

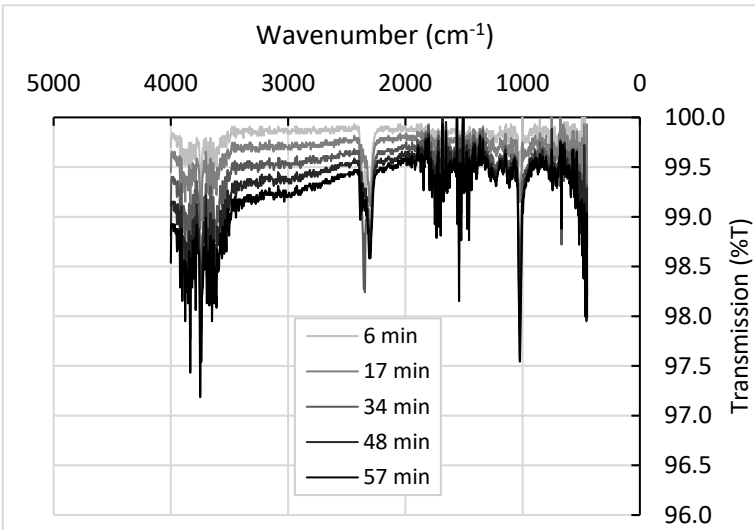
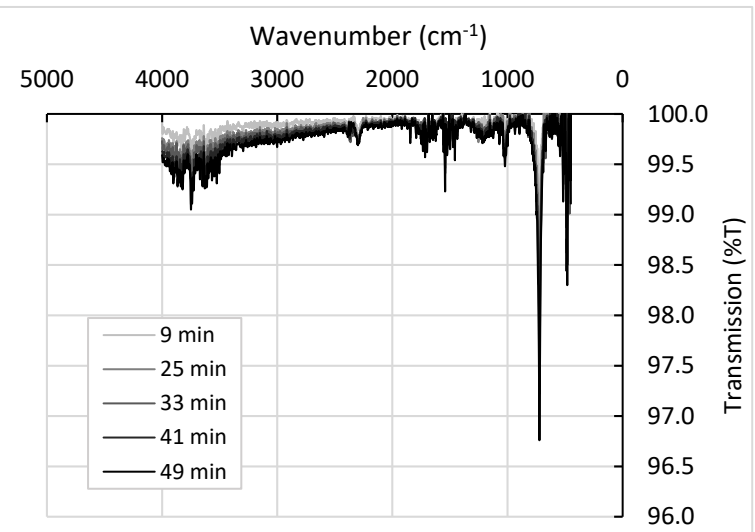
<u>General information</u>	
Type of data	Gas analysis
Place of experimentation	Material Engineering Department (SPECIFIC), Swansea University Prifysgol Abertawe
Dates of the experiments	2018 - 2020
<u>Feedstock</u>	
Type of faecal material	Faecal sludge from anaerobic baffled reaction from a decentralised wastewater treatment system
Location of collection	Durban, South Africa
Age before collection	Unknown
Moisture content	~ 85%wt
Total solids content	~ 15%wt
Volatile solids content	Not measured
Ash content	Not measured
Presence of trash?	Yes (mainly small pieces of paper after pre-screening during pit emptying)
Pre-treatment	Screening to remove trash
<u>Experimental Procedure</u>	
Drying experimental setup	Thermogravimetric analyser - simultaneous thermal analysis <i>Perkin Elmer STA 6000</i>
Holding or residence time	~ 40 - 80 min
Operating conditions	<ul style="list-style-type: none"> ○ Set temperature: 55 and 155°C ○ Heating rate: 10°C/min ○ Carrier gas: nitrogen ○ Flow rate: 30 mL/min
Sample form in the dryer	~ 40 mg in a crucible
Analysed parameters	Identification of chemical compounds in the gas stream
Employed method	Use of the Fourier transform infrared (FTIR) spectroscopy analyser <i>Perkin Elmer Spectrum 100</i>
<u>Publications</u>	
-	

Data source files	
-	
Additional Notes	
<ul style="list-style-type: none"> ○ Samples couriered from South Africa ○ FTIR analyser hyphenated to the STA ○ No quantification of the concentration of the identified compounds ○ Considerable drying of the sample before reaching the set temperature at 155°C 	
Description of Data	
<p>FTIR spectrum during drying up to 55°C at different times of analysis</p> 	<p>Observations</p> <ul style="list-style-type: none"> ○ Main regions identified: 4000 – 3400 cm^{-1} → H₂O (O-H stretch) 2400 – 2250 cm^{-1} → CO₂ 1800 – 650 cm^{-1} → possible organic compounds (ether, ester, alcohol, aromatic, amine, alkene) and H₂O scissoring ○ Gas from drying composed by water (as expected), carbon dioxide and organic compounds
<p>FTIR spectrum during drying up to 155°C at different times of analysis</p> 	

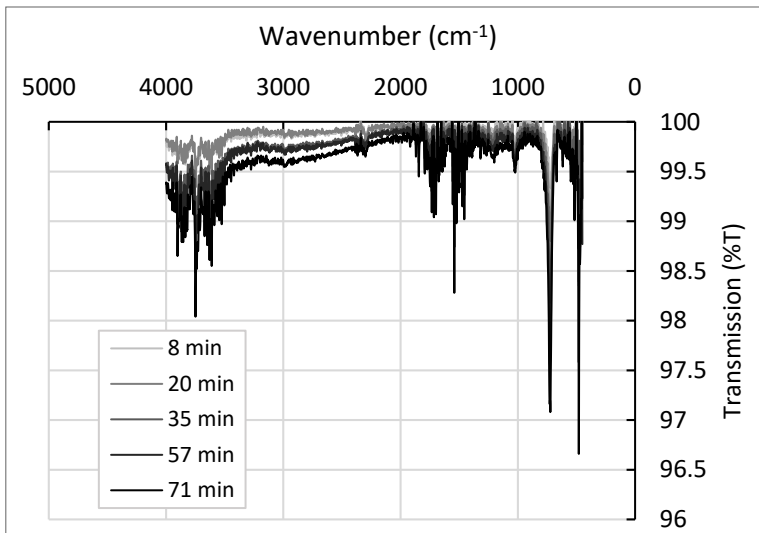
<u>General information</u>	
Type of data	Gas analysis
Place of experimentation	Material Engineering Department (SPECIFIC), Swansea University Prifysgol Abertawe
Dates of the experiments	2018 - 2020
<u>Feedstock</u>	
Type of faecal material	Faecal sludge from urine diversion dry toilets
Location of collection	Durban, South Africa
Age before collection	1 – 3 years
Moisture content	~ 70%wt
Total solids content	~ 30%wt
Volatile solids content	Not measured
Ash content	Not measured
Presence of trash?	Yes (mainly stones, hair and plastics)
Pre-treatment	Screening to remove the trash
<u>Experimental Procedure</u>	
Drying experimental setup	Thermogravimetric analyser - simultaneous thermal analysis <i>Perkin Elmer STA 6000</i>
Holding or residence time	~ 40 - 80 min
Operating conditions	<ul style="list-style-type: none"> ○ Set temperature: 55 and 155°C ○ Heating rate: 10°C/min ○ Carrier gas: nitrogen ○ Flow rate: 30 mL/min
Sample form in the dryer	~ 40 mg in a crucible
Analysed parameters	Identification of chemical compounds in the gas stream
Employed method	Use of the Fourier transform infrared (FTIR) spectroscopy analyser <i>Perkin Elmer Spectrum 100</i>
<u>Publications</u>	
-	

Data source files	
-	
Additional Notes	
<ul style="list-style-type: none"> ○ Samples couriered from South Africa ○ FTIR analyser hyphenated to the STA ○ No quantification of the concentration of the identified compounds ○ Considerable drying of the sample before reaching the set temperature at 155°C 	
Description of Data	
<p>FTIR spectrum during drying up to 55°C at different times of analysis</p> 	<p>Observations</p> <ul style="list-style-type: none"> ○ Main regions identified: 4000 – 3400 cm^{-1} \rightarrow H_2O (O-H stretch) 2400 – 2250 cm^{-1} \rightarrow CO_2 1800 – 650 cm^{-1} \rightarrow possible organic compounds (ether, ester, alcohol, aromatic, amine, alkene) and H_2O scissoring ○ Gas from drying composed by water (as expected), carbon dioxide and organic compounds
<p>FTIR spectrum during drying up to 155°C at different times of analysis</p> 	

<u>General information</u>	
Type of data	Gas analysis
Place of experimentation	Materials Engineering Department (SPECIFIC), Swansea University Prifysgol Abertawe
Dates of the experiments	2018 - 2020
<u>Feedstock</u>	
Type of faecal material	Faecal sludge from urine diversion dry toilets
Location of collection	Durban, South Africa
Age before collection	1 – 3 years
Moisture content	~ 95%wt
Total solids content	~ 5%wt
Volatile solids content	Not measured
Ash content	Not measured
Presence of trash?	Yes (mainly stones, hair and plastics)
Pre-treatment	Screening to remove the trash
<u>Experimental Procedure</u>	
Drying experimental setup	Thermogravimetric analyser - simultaneous thermal analysis <i>Perkin Elmer STA 6000</i>
Holding or residence time	~ 40 - 80 min
Operating conditions	<ul style="list-style-type: none"> ○ Set temperature: 55 and 155°C (during 80 and 40 minutes respectively) ○ Heating rate: 10°C/min ○ Carrier gas: nitrogen ○ Flow rate: 30 mL/min
Sample form in the dryer	~ 40 mg in a crucible
Analysed parameters	Identification of chemical compounds in the gas stream
Employed method	Use of the Fourier transform infrared (FTIR) spectroscopy analyser <i>Perkin Elmer Spectrum 100</i>
<u>Publications</u>	
-	

Data source files	
-	
Additional Notes	
<ul style="list-style-type: none"> ○ Samples couriered from South Africa ○ FTIR analyser hyphenated to the STA ○ No quantification of the concentration of the identified compounds ○ Considerable drying of the sample before reaching the set temperature at 155°C 	
Description of Data	
<p><u>FTIR spectrum during drying up to 55°C at different times of analysis</u></p> 	<p><u>Observations</u></p> <ul style="list-style-type: none"> ○ Main regions identified: 4000 – 3400 cm^{-1} \rightarrow H_2O (O-H stretch) 2400 – 2250 cm^{-1} \rightarrow CO_2 1800 – 650 cm^{-1} \rightarrow possible organic compounds (ether, ester, alcohol, aromatic, amine, alkene) and H_2O scissoring ○ Gas from drying composed by water (as expected), carbon dioxide and organic compounds
<p><u>FTIR spectrum during drying up to 155°C at different times of analysis</u></p> 	

<u>General information</u>	
Type of data	Gas analysis
Place of experimentation	Material Engineering Department (SPECIFIC), Swansea University Prifysgol Abertawe
Dates of the experiments	2018 - 2020
<u>Feedstock</u>	
Type of faecal material	Human faeces
Location of collection	Cranfield, UK
Age before collection	Fresh
Moisture content	~ 60%wt
Total solids content	~ 40%wt
Volatile solids content	Not measured
Ash content	Not measured
Presence of trash?	No
Pre-treatment	Mixing
<u>Experimental Procedure</u>	
Drying experimental setup	Thermogravimetric analyser - simultaneous thermal analysis <i>Perkin Elmer STA 6000</i>
Holding or residence time	~ 40 - 80 min
Operating conditions	<ul style="list-style-type: none"> ○ Set temperature: 55 and 155°C ○ Heating rate: 10°C/min ○ Carrier gas: nitrogen ○ Flow rate: 30 mL/min
Sample form in the dryer	~ 40 mg in a crucible
Analysed parameters	Identification of chemical compounds in the gas stream
Employed method	Use of the Fourier transform infrared (FTIR) spectroscopy analyser <i>Perkin Elmer Spectrum 100</i>
<u>Publications</u>	
-	

Data source files	
-	
Additional Notes	
<ul style="list-style-type: none"> ○ Fresh faeces collected from voluntary and anonymous donations ○ FTIR analyzer hyphenated to the STA ○ No quantification of the concentration of the identified compounds ○ Considerable drying of the sample before reaching the set temperature at 155°C 	
Description of Data	
<p>FTIR spectrum during drying up to 55°C at different times of analysis</p> 	<p>Observations</p> <ul style="list-style-type: none"> ○ Main regions identified: 4000 – 3400 cm^{-1} → H_2O (O-H stretch) 2400 – 2250 cm^{-1} → CO_2 1800 – 650 cm^{-1} → possible organic compounds (ether, ester, alcohol, aromatic, amine, alkene) and H_2O scissoring ○ Gas from drying composed by water (as expected), carbon dioxide and organic compounds
<p>FTIR spectrum during drying up to 155°C at different times of analysis</p> 