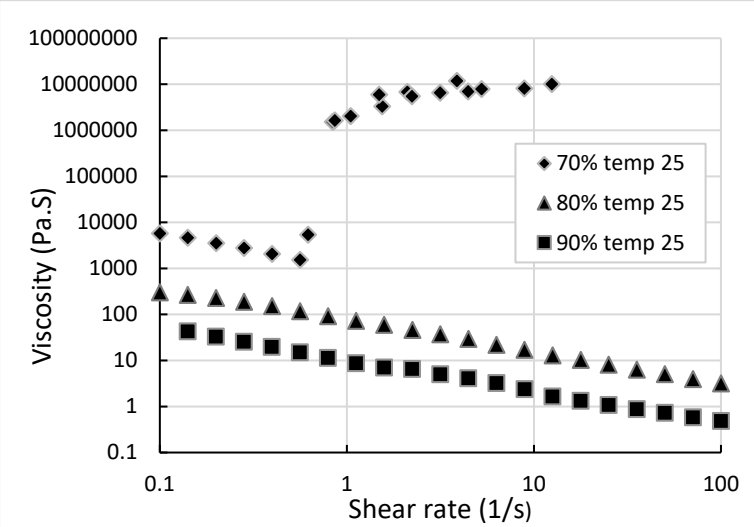
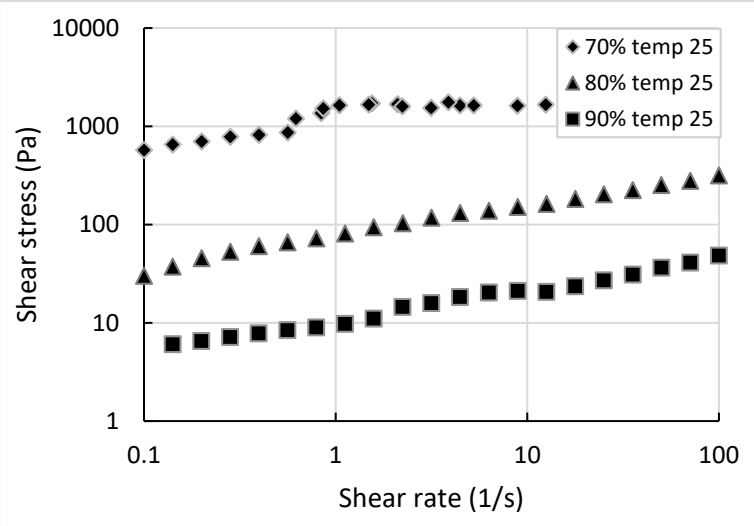
General information	
Type of data	Rheological properties
Place of experimentation	Pollution Research Group, University of KwaZulu-Natal (South Africa)
Dates of the experiments	2019 - 2020
Feedstock	
Type of faecal material	Faecal sludge from urine diversion dry toilet (UDDT)
Location of collection	Durban, South Africa
Age before collection	Up to 3 years
Moisture content	~ 70%wt
Total solids content	~ 30%wt
Volatile solids content	Not measured
Ash content	Not measured
Presence of trash?	Small amounts of trash
Pre-treatment	Trash removal
Experimental Procedure	
Drying experimental setup	Oven
Drying time	Until achieving 70, 80 and 90%wt moisture content
Operating conditions	105°C
Sample form	Faecal sludge in a cup
Analysed parameters	Viscosity and shear stress at 25, 40 and 60°C
Employed method	Rotational test in the rheometer *Anton Paar MCR 72* (SOP 8.8.4.1)
Publications	
-	

Data source files
https://www.dropbox.com/s/ukpo4iahlxkwnuz/2019-2020%20UDDT%20Rheological%20properties_PRG-UKZN.xlsx?dl=0
Additional Notes
Increase of moisture content to 70, 80 and 90%wt by the addition of water
Description of Data

Viscosity versus shear rate as a function of moisture content (in log scale) at temperature 25°C



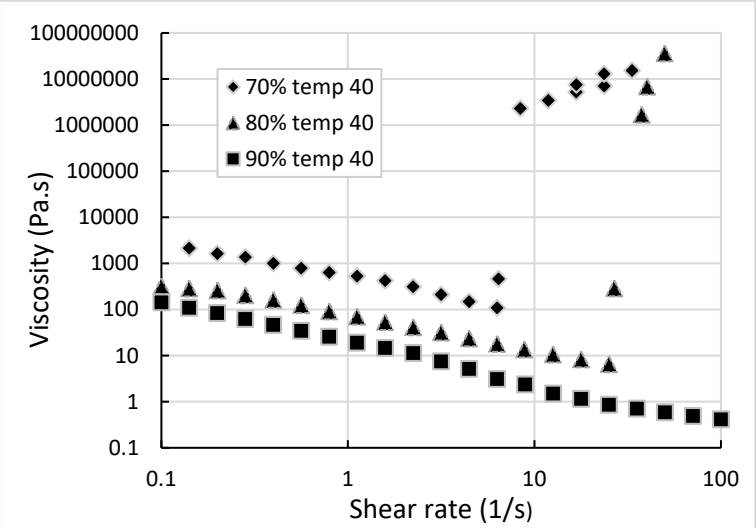
Shear stress versus shear rate as a function of moisture content (in log scale) at temperature 25°C



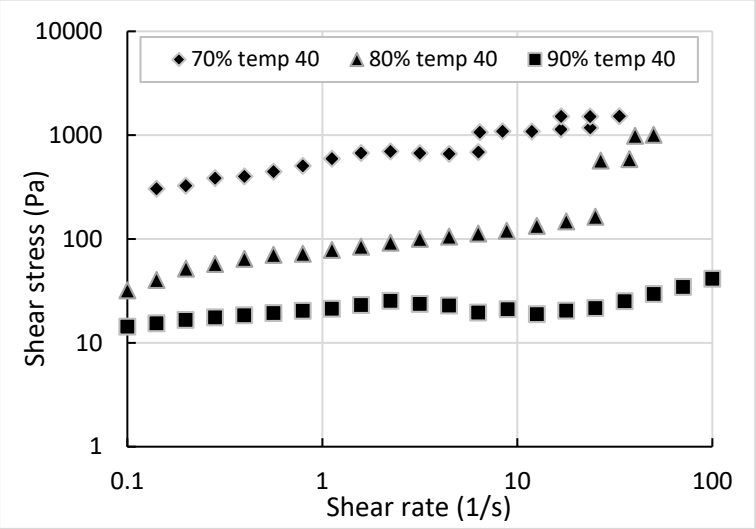
Observations:

- Shear thinning behavior (decrease of viscosity and increase of shear stress by increasing the shear rate)
- Lower shear stress and viscosity at higher moisture content

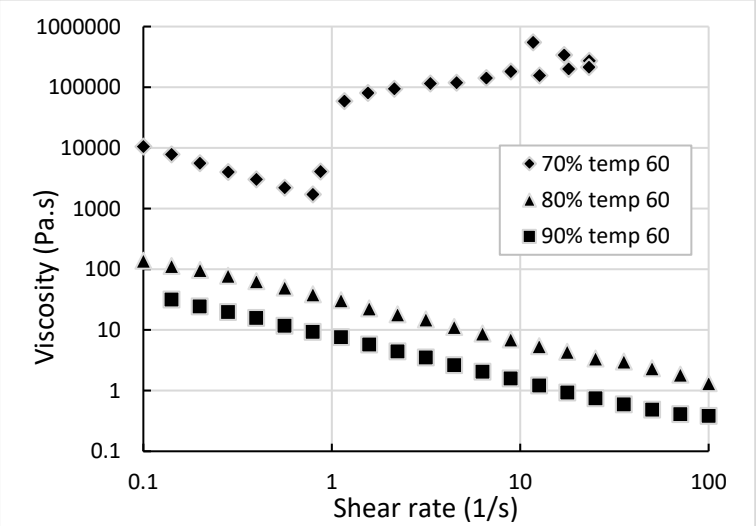
Viscosity versus shear rate as a function of moisture content (in log scale) at temperature 40°C



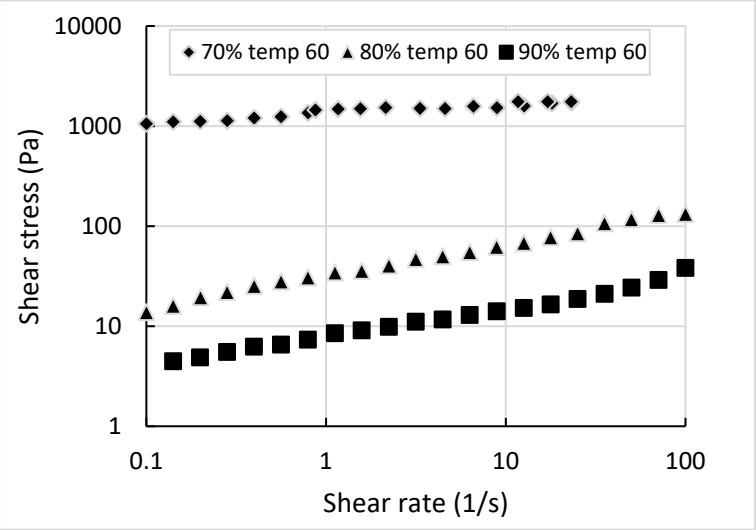
Shear stress versus shear rate as a function of moisture content (in log scale) at temperature 40°C



Viscosity versus shear rate as a function of moisture content (in log scale) at temperature 60°C



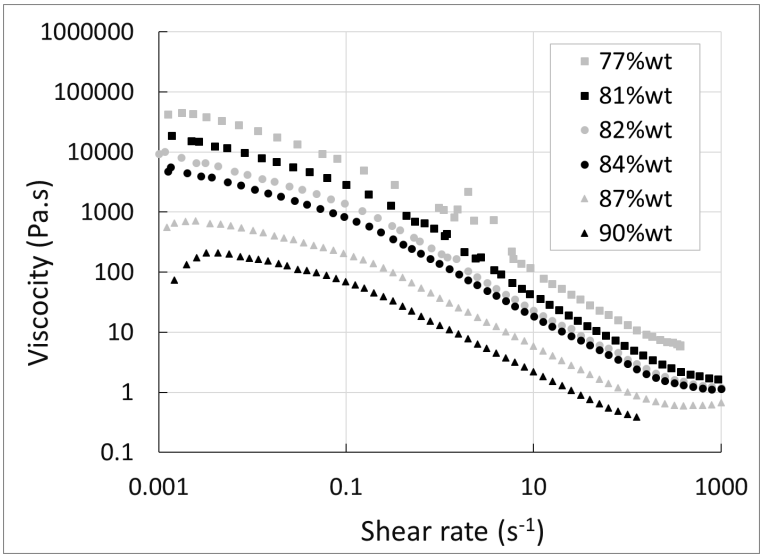
Shear stress versus shear rate as a function of moisture content (in log scale) at temperature 60°C



General information	
Type of data	Rheological properties
Place of experimentation	Pollution Research Group, University of KwaZulu-Natal (South Africa)
Dates of the experiments	2014 - 2015
Feedstock	
Type of faecal material	Faecal sludge from ventilated improved pit latrine (VIP)
Location of collection	Durban, South Africa
Age before collection	A few years
Moisture content	~ 80%wt
Total solids content	~ 20%wt
Volatile solids content	~ 70%db
Ash content	~ 30%db
Presence of trash?	Yes
Pre-treatment	Screening to remove the large pieces of trash
Experimental Procedure	
Drying experimental setup	Laboratory oven
Drying time	Until achieving 77%wt moisture content
Operating conditions	105°C
Sample form	Sludge in a crucible
Analysed parameters	Viscosity and shear stress
Employed method	Rotational test in the rheometer *Anton Paar MCR 51* (SOP 8.8.4.1)
Publications	
Septien, S., Pocock, J., Teba, L., Velkushanova, K., & Buckley, C. A. (2018). Rheological characteristics of faecal sludge from VIP latrines and implications on pit emptying. Journal of environmental management, 228, 149-157.	

Data source files
https://www.dropbox.com/s/7hkn5o22aj70trs/Rheological%20properties%20of%20VIP%20FS%20%282014-2015%29.xlsx?dl=0
Additional Notes
○ Increase of moisture content to 81, 84, 87 and 90%wt by the addition of water
Description of Data

Viscosity versus shear rate as a function of moisture content in log scale



Observations:

- Shear thinning behavior (decrease of viscosity and increase of shear stress by increasing the shear rate)
- Lower shear stress and viscosity at higher moisture content

General information	
Type of data	Rheological properties
Place of experimentation	Pollution Research Group, University of KwaZulu-Natal (South Africa)
Dates of the experiments	2019 - 2020
Feedstock	
Type of faecal material	Faecal sludge from ventilated improved pit latrine toilet (VIP)
Location of collection	Durban, South Africa
Age before collection	3 to 5 years
Moisture content	~ 70%wt
Total solids content	~ 30%wt
Volatile solids content	Not measured
Ash content	Not measured
Presence of trash?	Small amounts of trash
Pre-treatment	Trash removal
Experimental Procedure	
Drying experimental setup	Oven
Drying time	Until achieving 70, 80 and 90%wt moisture content
Operating conditions	105°C
Sample form	Faecal sludge in a cup
Analysed parameters	Viscosity and shear stress at 25, 40 and 60°C
Employed method	Rotational test in the rheometer *Anton Paar MCR 72*(SOP 8.8.4.1)
Publications	
-	

Data source files

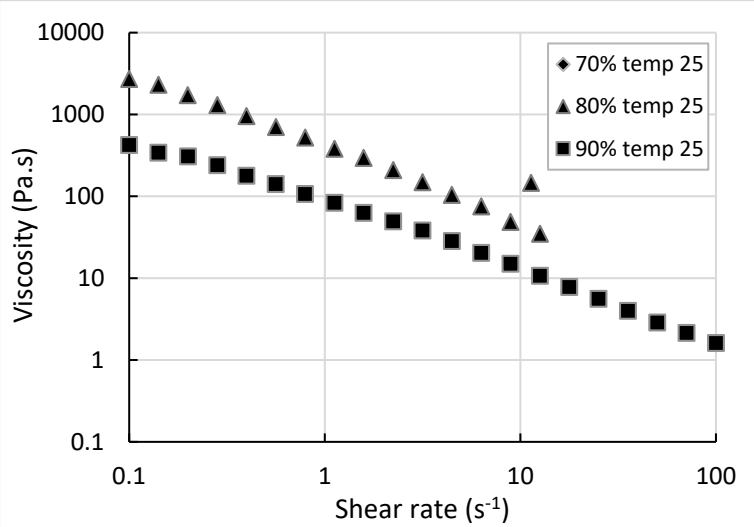
https://www.dropbox.com/s/gor5qyq0yx0zh1y/2019-2020%20VIP%20Rheological%20Properties_PRG-UKZN%20graphs.xlsx?dl=0

Additional Notes

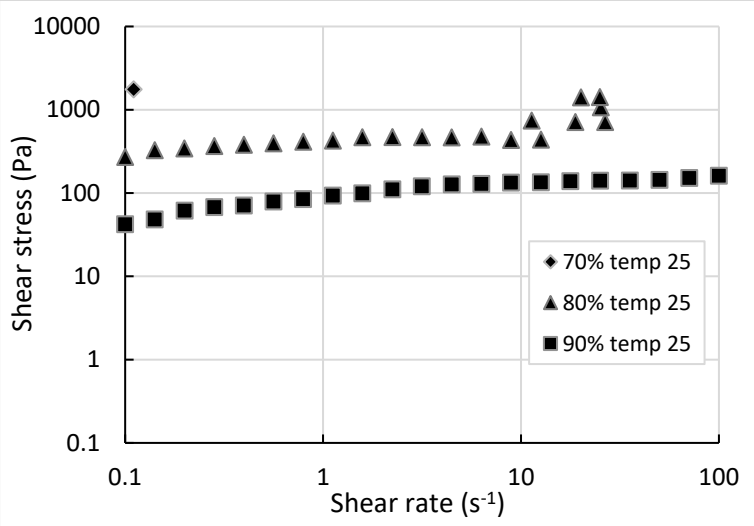
- Increase of moisture content to 70, 80 and 90%wt by the addition of water

Description of Data

Viscosity versus shear rate as a function of moisture content (in log scale) at temperature 25°C



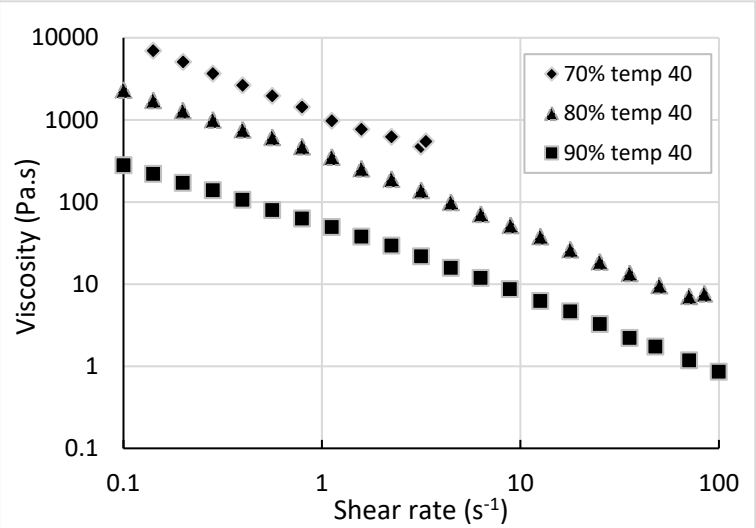
Shear stress versus shear rate as a function of moisture content (in log scale) at temperature 25°C



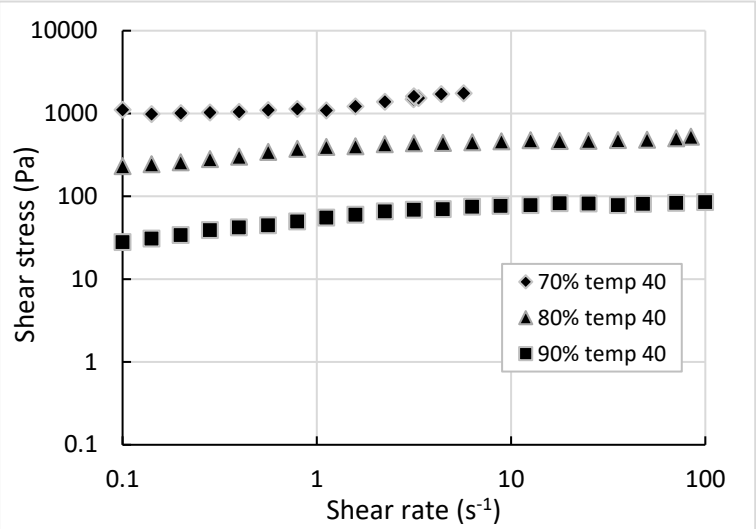
Observations:

- Shear thinning behavior (decrease of viscosity and increase of shear stress by increasing the shear rate)
- Lower shear stress and viscosity at higher moisture content
- Similar viscosity and shear stress at the different temperatures

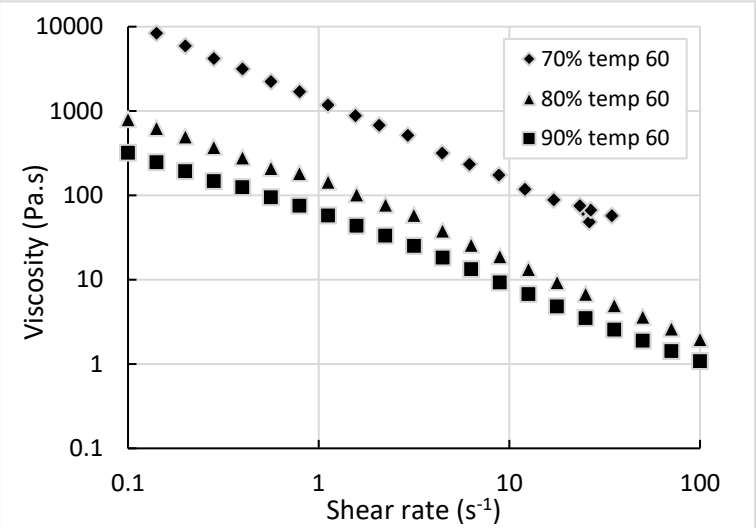
Viscosity versus shear rate as a function of moisture content (in log scale) at temperature 40°C



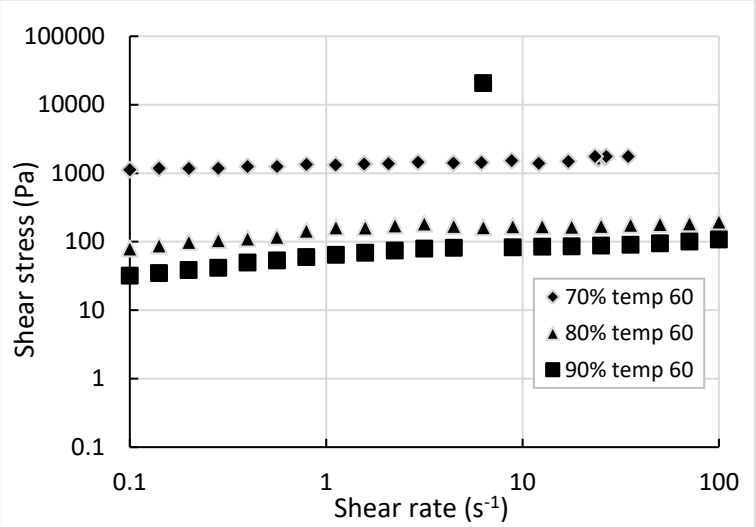
Shear stress versus shear rate as a function of moisture content (in log scale) at temperature 40°C



Viscosity versus shear rate as a function of moisture content (in log scale) at temperature 60°C



Shear stress versus shear rate as a function of moisture content (in log scale) at temperature 60°C



General information	
Type of data	Rheological properties
Place of experimentation	Pollution Research Group, University of KwaZulu-Natal (South Africa)
Dates of the experiments	2012 - 2013
Feedstock	
Type of faecal material	Fresh faeces
Location of collection	Durban, South Africa
Age before collection	A few days
Moisture content	70 to 90%wt
Total solids content	10 to 30%wt
Volatile solids content	80 to 95%db
Ash content	5 to 20%db
Presence of trash?	No
Pre-treatment	None
Experimental Procedure	
Drying experimental setup	None
Drying time	N.A.
Operating conditions	N.A.
Sample characteristics in the dryer	N.A.
Analysed parameters	Viscosity and shear stress
Employed method	Rotational test in the rheometer *Anton Paar MCR 51* (SOP 8.8.4.1)
Publications	
Woolley, S. M., Buckley, C. A., Pocock, J., & Foutch, G. L. (2014). Rheological modelling of fresh human faeces. *Journal of water, sanitation and hygiene for development*, *4*(3), 484-489. Woolley, S. M., Cottingham, R. S., Pocock, J., & Buckley, C. A. (2014). Shear rheological properties of fresh human faeces with different moisture content. *Water SA*, *40*(2), 273-276.	

Data source files

https://www.dropbox.com/s/952jogm6tcfgraq/Rheoloigcal%20properties%20of%20fresh%20faeces_%282012-2013%29.xlsx?dl=0

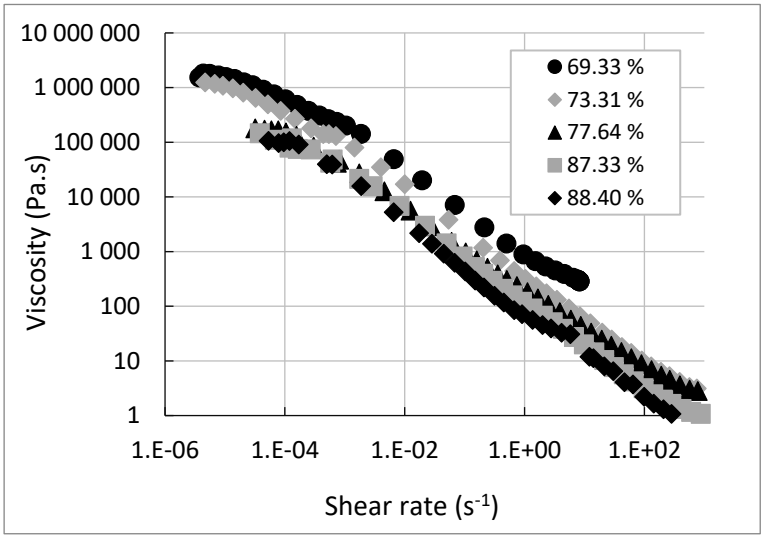
https://www.dropbox.com/s/dzvc8huagzd1qh2/Fresh%20faeces_Viscosity%20vs%20Moisture%20content%20at%20Fixed%20Shear%20Rate%20%282012-2013%29.xlsx?dl=0

Additional Notes

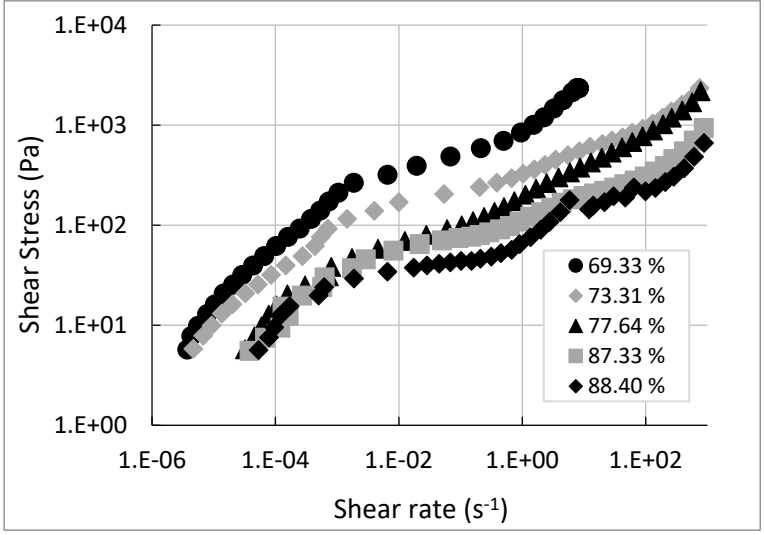
- Fresh faeces collected from voluntary and anonymous donations from healthy young adults
- Rheological tests performed in each of the individual donations

Description of Data

Viscosity versus shear rate as a function of moisture content (in log scale)



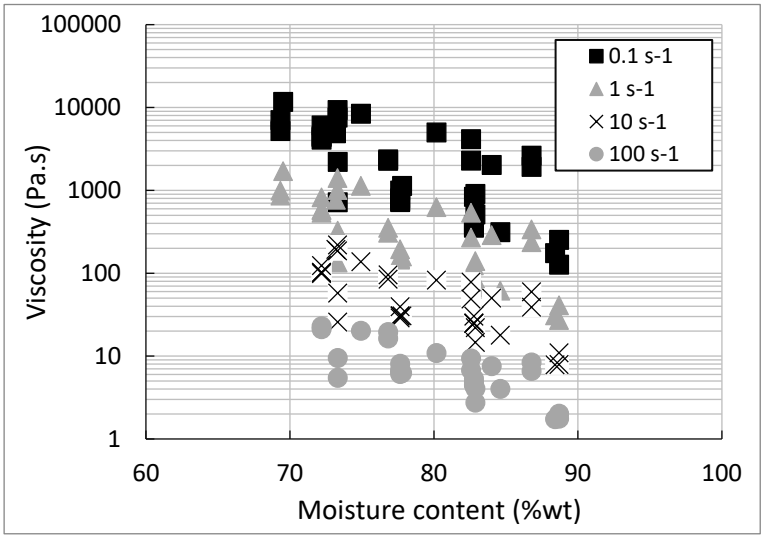
Shear stress versus shear rate as a function of moisture content (in log scale)



Observations:

- Shear thinning behavior (decrease of viscosity and increase of shear stress by increasing the shear rate)
- Lower shear stress and viscosity at higher moisture content

Viscosity versus moisture content as a function of shear rate (in log scale)



General information	
Type of data	Rheological properties
Place of experimentation	Pollution Research Group, University of KwaZulu-Natal (South Africa)
Dates of the experiments	2019 - 2020
Feedstock	
Type of faecal material	Fresh faeces
Location of collection	Durban, South Africa
Age before collection	A few days
Moisture content	~80%wt
Total solids content	~20%wt
Volatile solids content	~85%db
Ash content	~15%db
Presence of trash?	No
Pre-treatment	Mixing
Experimental Procedure	
Drying experimental setup	Natural drying (in the open-air)
Drying time	16 weeks
Operating conditions	○ Ambient temperature (~ 20°C) ○ Ambient relative humidity (~ 60%)
Sample form in the dryer	900 g of sample placed in 1 L plastic bucket
Analysed parameters	Viscosity and shear stress
Employed method	Rotational test in the rheometer Anton Paar MCR 51 (SOP Method 8.8.4.1)
Publications	
-	

Data source files

https://www.dropbox.com/s/xbv6su0jxsipiok/2019-2020%20Natural%20drying%20of%20fresh%20faeces%20in%20the%20open%20air_UKZN%20PRG.xlsx?dl=0

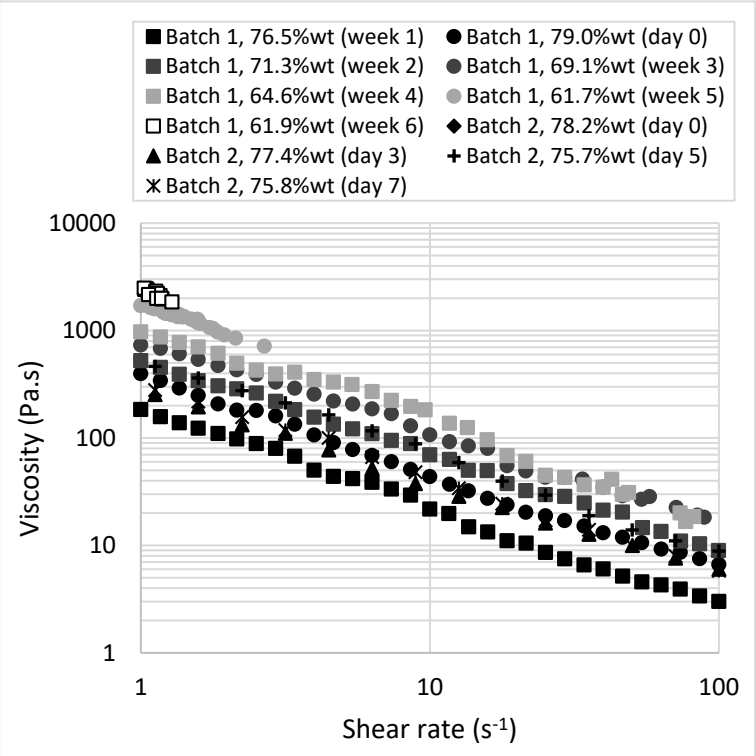
https://www.dropbox.com/s/a0g1023a6uoc5gk/2019-2020%20Natural%20drying%20of%20fresh%20faeces%20in%20open%20air%20Batch%202_%20Rheological%20properties_UKZN%20PRG.xlsx?dl=0

Additional Notes

- Fresh faeces collected from voluntary and anonymous donations
- Containers with sample placed in a ventilated area
- Mesh placed at the opening of the container to avoid the development of maggots
- Samples from batch 1 analysed in a weekly basis for 16 weeks
- Samples from batch 2 analysed at days 0, 3, 5 and 7 during one week

Description of Data

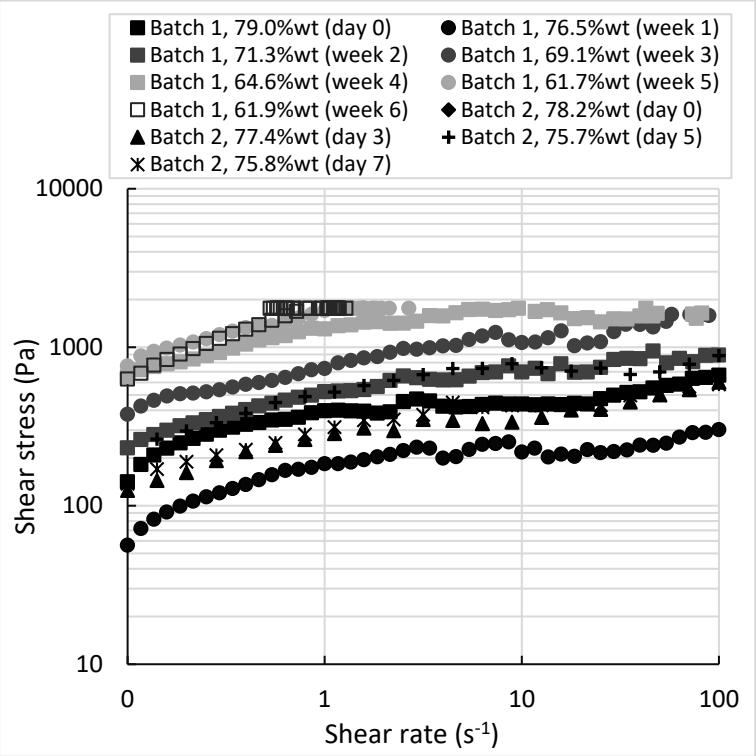
Viscosity versus shear rate as a function of moisture content for the samples from batch 1 and 2 (in log scale)



Observations:

- Shear thinning behavior (decrease of viscosity and increase of shear stress by increasing the shear rate)
- Reduction in viscosity and shear stress in week 1
- Increase of shear stress and viscosity by increasing moisture content after week 1
- Not possible to induce a flow below 61.9 %wt moisture content (after six weeks of drying)

Shear stress versus shear rate as a function of moisture content for the samples from batch 1 and 2 (in log scale)



General information	
Type of data	Viscoelastic properties
Place of experimentation	Pollution Research Group, University of KwaZulu-Natal (South Africa)
Dates of the experiments	2014 - 2015
Feedstock	
Type of faecal material	Faecal sludge from ventilated improved pit latrine
Location of collection	Durban, South Africa
Age before collection	A few years
Moisture content	~ 80%wt
Total solids content	~ 20%wt
Volatile solids content	~ 70%db
Ash content	~ 30%db
Presence of trash?	Yes
Pre-treatment	Screening to remove the large pieces of trash
Experimental Procedure	
Drying experimental setup	Laboratory oven
Drying time	Until achieving 77, 75 and 69%wt moisture content
Operating conditions	105°C
Sample form	Sludge in a crucible
Analysed parameters	Loss and storage modulus
Employed method	Dynamic test in the rheometer *Anton Paar MCR 51* (SOP 8.8.4.1)
Publications	
-	

Data source files

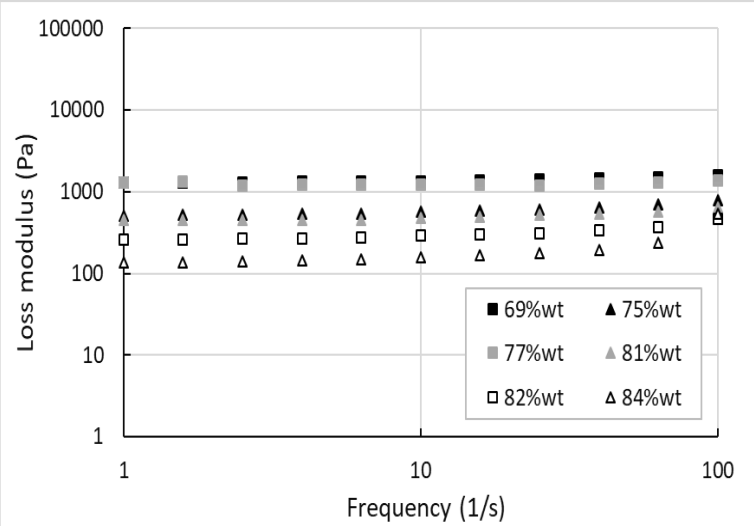
https://www.dropbox.com/s/pelvw9356fuux11/VIP%20Viscoelastic%20properties_%282014-2015%29.xlsx?dl=0

Additional Notes

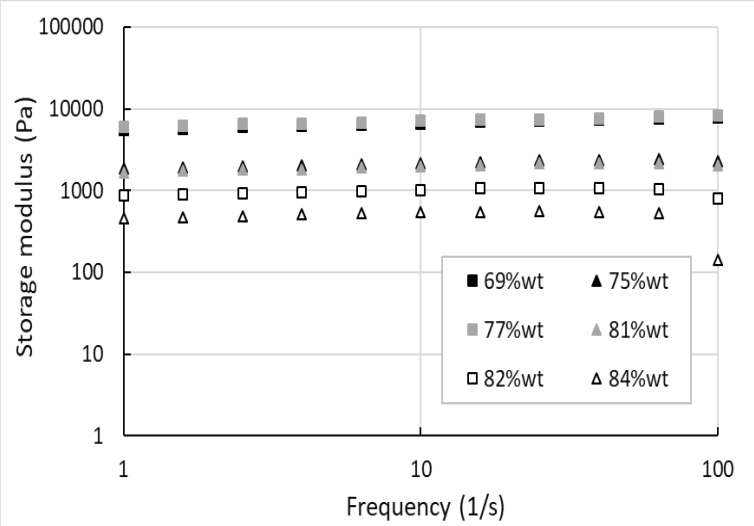
- Increase of moisture content to 82 and 84%wt by the addition of water
- Loss and storage modulus referring to the viscous and elastic component respectively

Description of Data

Loss modulus versus frequency as a function of moisture content (in log scale)



Storage modulus versus frequency as a function of moisture content (in log scale)



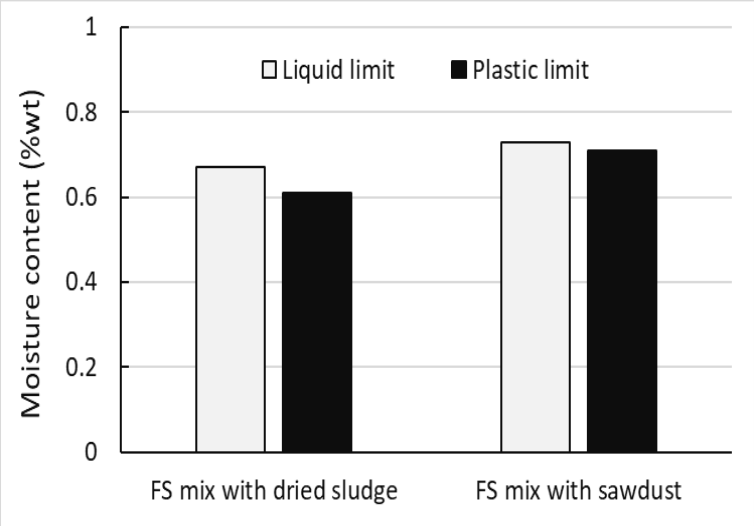
Observations:

- Linear viscoelastic region (loss and storage modulus constant across the frequency range)
- Sludge at rest more elastic than viscous (storage modulus > loss modulus)

General information	
Type of data	Plastic properties
Place of experimentation	Pollution Research Group, University of KwaZulu-Natal (South Africa)
Dates of the experiments	2014 - 2015
Feedstock	
Type of faecal material	Faecal sludge from ventilated improved pit latrine (VIP)
Location of collection	Durban, South Africa
Age before collection	Up to 5 years
Moisture content	~ 80%wt
Total solids content	~ 20%wt
Volatile solids content	~ 70%db
Ash content	~ 30%db
Presence of trash?	Yes
Pre-treatment	Screening to remove the large pieces of trash
Experimental Procedure	
Drying experimental setup	N.A.
Drying time	N.A.
Operating conditions	N.A.
Sample form in the dryer	N.A.
Analysed parameters	Atterberg limits (plastic and liquid limits)
Employed method	Penetrometer (SOP 8.8.4.2)
Publications	
Septien, S., Singh, A., Mirara, S. W., Teba, L., Velkushanova, K., & Buckley, C. A. (2018). 'LaDePa'process for the drying and pasteurization of faecal sludge from VIP latrines using infrared radiation. South African journal of chemical engineering, 25, 147-158.	

Data source files
-
Additional Notes
○ Decrease of moisture content of the sludge by adding dried sludge or wood sawdust
Description of Data

Moisture content of the sludge at the liquid and plastic limits



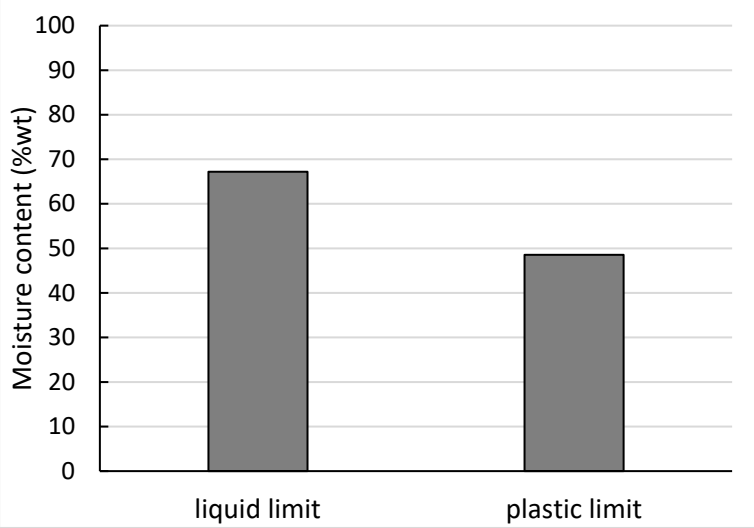
Observations:

- Raw sludge beyond the liquid limit
- Faster transition to semi-solid and solid state using sawdust than dried sludge to lower moisture content (higher liquid and plastic limit)

General information	
Type of data	Plastic properties
Place of experimentation	Pollution Research Group, University of KwaZulu-Natal (South Africa)
Dates of the experiments	2019 - 2020
Feedstock	
Type of faecal material	Faecal sludge from urine diversion dry toilet (UDDT)
Location of collection	Durban, South Africa
Age before collection	Up to 3 years
Moisture content	~ 70%wt
Total solids content	~ 30%wt
Volatile solids content	Not measured
Ash content	Not measured
Presence of trash?	Small amounts of trash
Pre-treatment	Trash removal
Experimental Procedure	
Drying experimental setup	Oven
Drying time	Until achieving 20, 30, 40, 50, 60, 70, 80 and 90%wt moisture content
Operating conditions	105°C
Sample form in the dryer	Faecal sludge spread in a tray
Analysed parameters	Atterberg limits (plastic and liquid limits)
Employed method	Penetrometer (SOP 8.8.4.2)
Publications	
-	

Data source files
https://www.dropbox.com/s/hknu2xe8ymek4ai/2019-2020%20Cone%20penetrometer%20tests_PRG-UKZN.xlsx?dl=0
Additional Notes
-
Description of Data

Moisture content of the sludge at the liquid and plastic limits



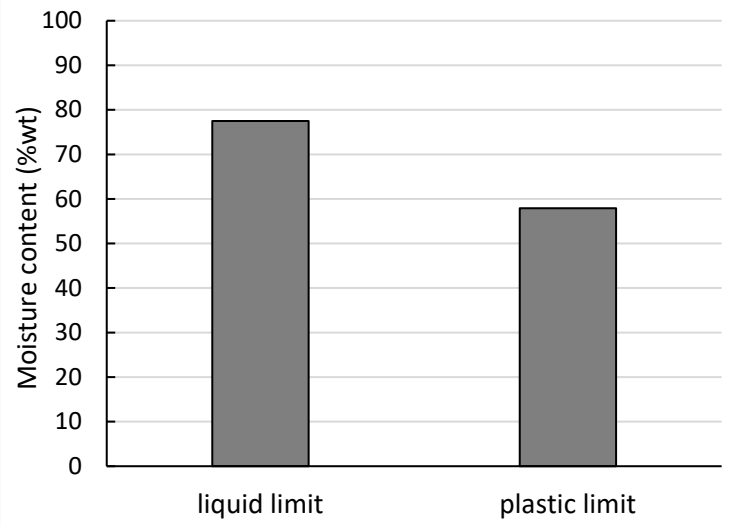
Observations

- Liquid limit at around 70%wt moisture content
- Plastic limit at around 50%wt moisture content

General information	
Type of data	Plastic properties
Place of experimentation	Pollution Research Group, University of KwaZulu-Natal (South Africa)
Dates of the experiments	2019 - 2020
Feedstock	
Type of faecal material	Faecal sludge from ventilated improved pit latrine toilet (VIP)
Location of collection	Durban, South Africa
Age before collection	Up to 5 years
Moisture content	~ 70%wt
Total solids content	~ 30%wt
Volatile solids content	Not measured
Ash content	Not measured
Presence of trash?	Small amounts of trash
Pre-treatment	Trash removal
Experimental Procedure	
Drying experimental setup	Oven
Drying time	Until achieving 20, 30, 40, 50, 60, 70, 80 and 90%wt moisture content
Operating conditions	105°C
Sample form in the dryer	Faecal sludge spread in a tray
Analysed parameters	Atterberg limits (plastic and liquid limits)
Employed method	Penetrometer (SOP 8.8.4.2)
Publications	
-	

Data source files
https://www.dropbox.com/s/hknu2xe8ymek4ai/2019-2020%20Cone%20penetrometer%20tests_PRG-UKZN.xlsx?dl=0
Additional Notes
-
Description of Data

Moisture content of the sludge at the liquid and plastic limits



Observations

- Liquid limit at around 80%wt moisture content
- Plastic limit at around 60%wt moisture content

General information	
Type of data	Stickiness
Place of experimentation	Pollution Research Group, University of KwaZulu-Natal, Durban, South Africa
Dates of the experiments	2019 - 2020
Feedstock	
Type of faecal material	Faecal sludge from urine diversion dry toilet (UDDT)
Location of collection	Durban, South Africa
Age before collection	Up to 3 years
Moisture content	~ 70%wt
Total solids content	~ 30%wt
Volatile solids content	Not measured
Ash content	Not measured
Presence of trash?	Small amounts of trash
Pre-treatment	Trash removal
Experimental Procedure	
Drying experimental setup	Oven
Drying time	Until achieving 20, 30, 40, 50 and 60%wt moisture content
Operating conditions	105°C
Sample form	Faecal sludge in a recipient
Analysed parameters	Adhesive and cohesive forces at 25, 40, 60 and 80°C
Employed method	Use of the *Stable microsystems TA. XT express* texture analyser at different temperatures (25, 40, 60 and 80°C) (SOP 8.8.4.5)
Publications	
-	

Data source files

https://www.dropbox.com/s/6bgaz9t6juefmbz/2019%20-%202020%20UDDT%20Stickiness_PRG.xlsx?dl=0

https://www.dropbox.com/s/ftc2fgreukf5krp/2019-2020%20UDDT%20Stickiness%20at%2040%20degrees%20C_PRG-UKZN.xlsx?dl=0

https://www.dropbox.com/s/6q4u2o9b6ulwkw1/2019-2020%20UDDT%20Stickiness%20at%2060%20degrees%20C_PRG-UKZN.xlsx?dl=0

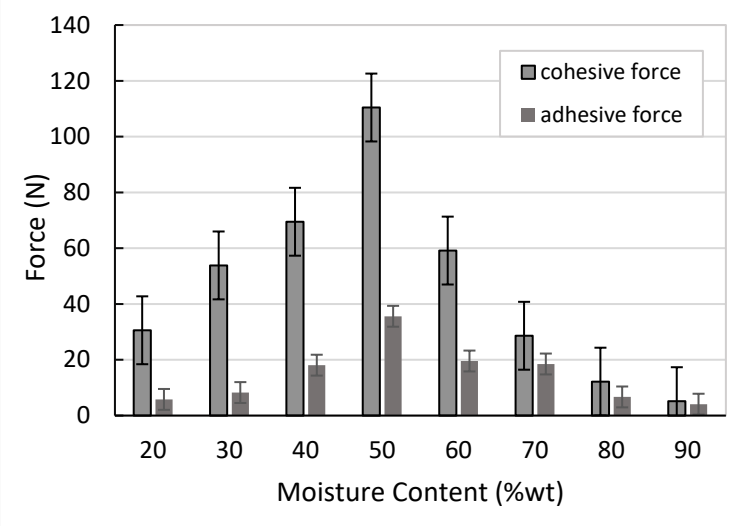
https://www.dropbox.com/s/rbw8oiojh6r05yn/2019-2020%20UDDT%20Stickiness%20at%2080%20degrees%20C_PRG-UKZN.xlsx?dl=0

Additional Notes

- Use of a compression plate probe for the tests in the texture analyser
- The moisture content of the sludge increased by adding water

Description of Data

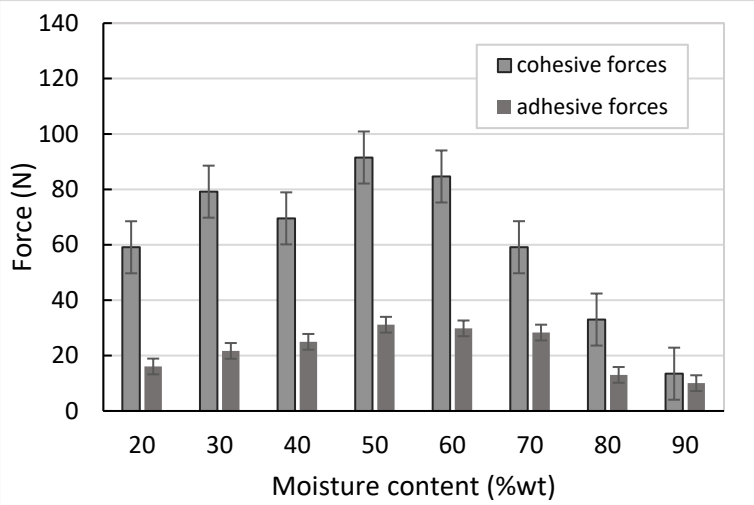
Cohesive and adhesive force versus moisture content at 25°C



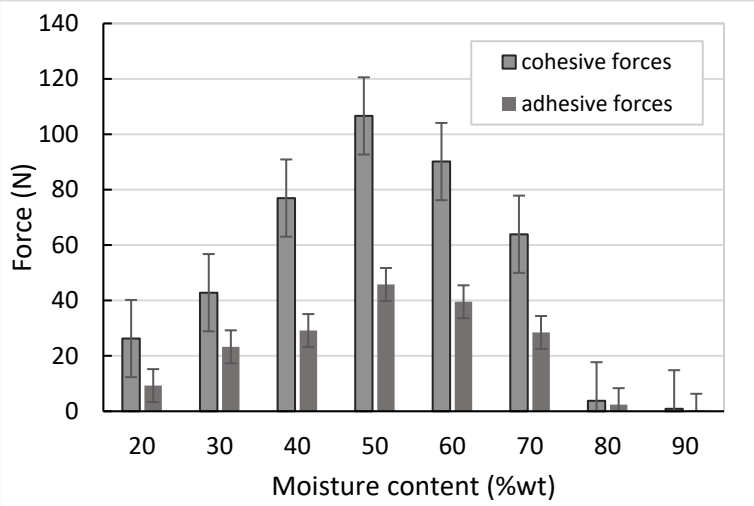
Observations:

- Sticky region between 40 and 60%wt at 25, 40, 60 and 80°C
- Stickiness peak achieved at 50%wt at 25, 40, 60 and 80°C
- Cohesive forces greater than adhesive forces

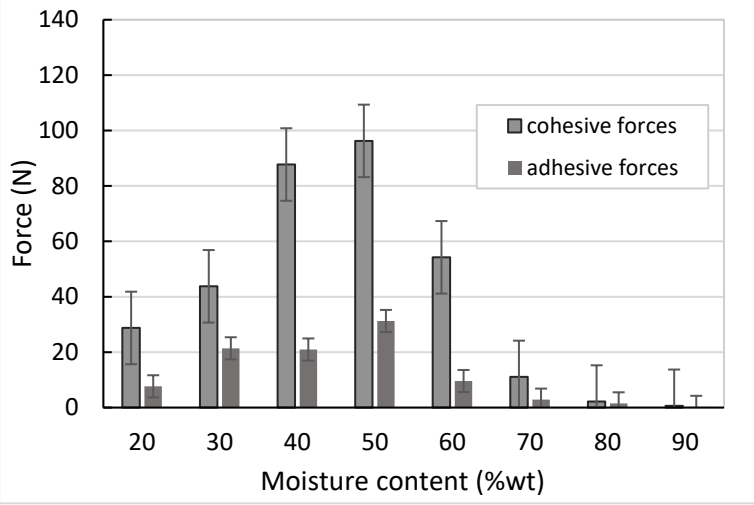
Cohesive and adhesive force versus moisture content at 40°C



Cohesive and adhesive force versus moisture content at 60°C



Cohesive and adhesive force versus moisture content at 80°C



General information	
Type of data	Stickiness
Place of experimentation	Pollution Research Group, University of KwaZulu-Natal (South Africa)
Dates of the experiments	2019-2020
Feedstock	
Type of faecal material	Faecal sludge from ventilated improved pit latrine toilet (VIP)
Location of collection	Durban, South Africa
Age before collection	Up to 5 years
Moisture content	~ 70%wt
Total solids content	~ 30%wt
Volatile solids content	Not measured
Ash content	Not measured
Presence of trash?	Small amounts of trash
Pre-treatment	Trash removal
Experimental Procedure	
Drying experimental setup	Oven
Drying time	Until achieving 20, 30, 40, 50 and 60%wt moisture content
Operating conditions	105°C
Sample form	Faecal sludge in a recipient
Analysed parameters	Adhesive and cohesive forces at 25, 40, 60 and 80°C
Employed method	Use of the *Stable microsystems TA. XT express* texture analyser at different temperatures (25, 40, 60 and 80°C) (SOP 8.8.4.5)
Publications	
-	

Data source files

https://www.dropbox.com/s/lvl7yyk47okwtfn/2019%20-%202020%20VIP%20Stickiness%20at%2025%20Degrees%20%28Ambient%20temp%29_PRG.xlsx?dl=0
https://www.dropbox.com/s/hudmu0dbx55rz3o/2019-2020%20VIP%20Stickiness%20at%2040%20degrees%20C_PRG-UKZN.xlsx?dl=0

https://www.dropbox.com/s/yablfax6psqvpn3/2019-2020%20VIP%20Stickiness%20at%2060%20degrees%20C_PRG-UKZN.xlsx?dl=0

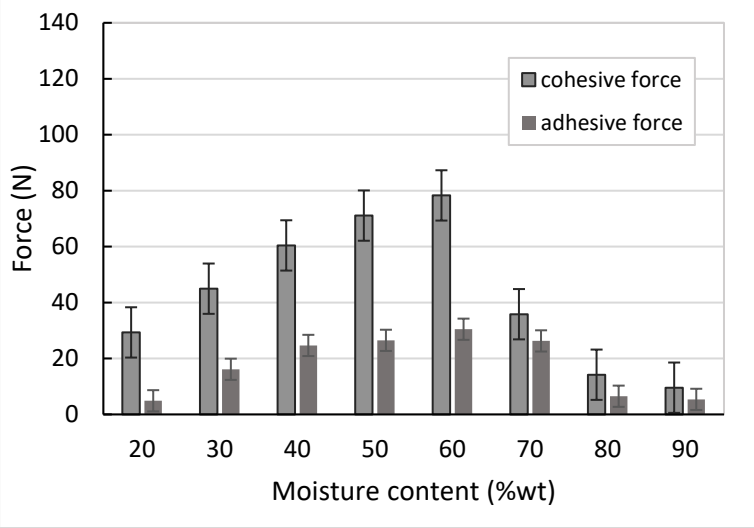
https://www.dropbox.com/s/ejk1g2z2k46edwk/Cleaned%20uddt%20temp%2080%281%29.xlsx?dl=0

Additional Notes

- Use of a compression plate probe for the tests in the texture analyser
- The moisture content of the sludge increased by adding water

Description of Data

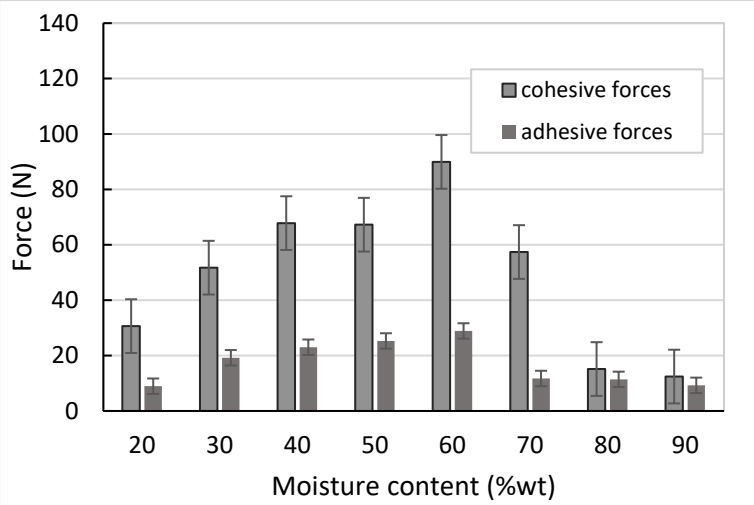
Cohesive and adhesive force versus moisture content at 25°C



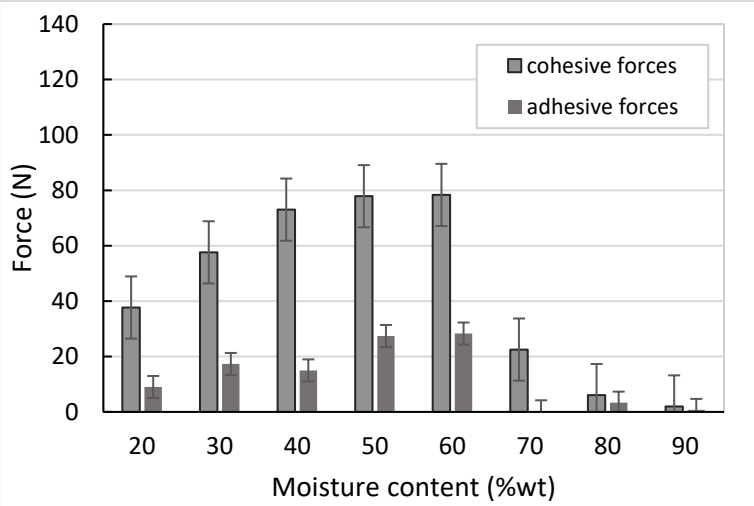
Observations:

- Sticky region between 40 and 60%wt at 25, 40, 60 and 80°C
- Stickiness peak achieved at 60%wt at 25, 40, 60 and 80°C
- Cohesive forces greater than adhesive forces
- Higher cohesive and adhesive forces at the sticky point at 80°C compared to lower temperatures

Cohesive and adhesive force versus moisture content at 40°C



Cohesive and adhesive force versus moisture content at 60°C



Cohesive and adhesive force versus moisture content at 80°C