Data Dictionary-Tribology Data

# The “[ExperimentName].mat” file format

Each “[ExperimentName].mat” has the following fields within it.

1. Overview- use this
2. data- use this
3. averagePlusStd- use this for plotting only
4. tribometer-don’t use
5. paramfile-don’t use
6. Experiments- don’t use this

In the following sections, this guide will explain the structure of each field.

## 1) “Overview” Field

* TribometerNumber: The instrument can test 4 samples at once, this just corresponds to which portion of the instrument tested this sample.
  + Variable Type: Controlled, measuring, monitoring (uncontrolled))
  + Units: mm, N, m, mm3, °C, %RH, etc.
* EnableLog: Just shows the Experiment was active.
* Sample: Name of the sample as defined by the user.
* SampleID: User can provide additional information here about the sample
* Project: user defined project name (typically each lab member has their own project)
* Countersample: user enters the name of the countersample slid against the polymer
* Load: The applied force to the tribometer
* Date: The date the test began
* Stroke: the distance the test was slid each cycle (in terms of mm)
* Velocity: the speed (in mm/s) the sample was slid at during testing.
* User: Name of person who ran the test
* Environment: type of gas/liquid the experiment was run in
* Other Details: User can enter other information about the experiment here.
* L: Sample length in mm
* W: sample width in mm
* H: sample height in mm
* initialmass: mass of the sample in grams before testing begins
* initialmassWithHolder: mass of the sample and sample holder in grams before testing begins
* initialReferenceMass: sometimes a reference mass is used to measure water absorption, the mass of the reference mass would be added here.
* density: density of the sample in grams per mm^3 (initialmass/(LWH))
* Major1: the name of the major component of the polymer composite being tested
* Percent1: the weight percentage of the Major1 phase
* Minor2→Minor6: the name of the minor component within the polymer composite being tested
* Percent2→Percent6: the weight percentage of the minor phase.

## 2) “data” Field

* Experiment→ Number at which the experiment was performed.
* CompleteLog→ This represents if the experiment has finished or not (1-it’s completed, 0-it’s unfinished). This doesn’t always get updated, so please ignore it.
* TestCycles→ The number of strokes in the tribometer. One cycle represents a stroke going back and forth.
* TotalCycles→The total number of cycles, adding up the previous ones.
* TestStroke→Testing the distance the test was slid each cycle. The units are mm.
* TestDistance→Testing the distance the test moved each cycle. The units are mm.
* TotalDistance→The total distance the test moves each cycle, adding up the previous distances. The units are mm.
* Date→the date the test began
* mass→the mass of the sample. (in terms of grams)
* umass→the uncertainty in mass of the sample after the test was completed (in terms of grams)
* massWithHolder→the polymer sample is held by a small clamp. This allows the tribometer user to quickly mass both the sample and clamp together. (in terms of grams)
* referenceMass→ if the polymer is hydrophilic, the sample may gain mass due to changes in humidity. To counter that, sometimes the user will keep a sample in the same environment as the test but will not slide the sample. This allows a baseline the user can use to see how much mass the sample gains/loses due to changes in humidity.
* V→the speed the sample was slid at (in mm/s)
* uV→The uncertainty in speed the sample was slid after each cycle (in mm/s)
* Fn→The average normal force applied to the sample for each experiment (in Newtons)
* FnStd→The standard deviation of the average normal force (in Newtons)
* FnD→ The product of normal force times sliding distance (Newtons \* mm)
* uFnD→ The uncertainty of the normal force times sliding distance (Newtons \* mm)
* mu→The coefficient of friction between the sample and the tribometer.
* muStd→The standard deviation of the average coefficient of friction for each experiment
* KtotalMonte→ Runs Monte Carlo simulations to predict a possible outcome for the wear rate of the sample. (units: m3/m)
* UKMonteTotal→The uncertainty in wear rates of the sample calculated from Monte Carlo Simulations. (units: m3/m)
* BKMonteTotal→ The y intercept of the fit of the line of Volume lost (y axis) and the Fn\*D (x-axis) this should have units of mm3
* KTestMonteN2:KTestMonteN5→Runs Monte Carlo simulations for the last two data points from the uncertainty of the data points. (units: m3/m)
* UKMonteN2:UKMonteN5→The uncertainty in wear rates from the Monte Carlo simulations. (units: m3/m)
* BMonteN2:BMonteN5→The y-intercepts of the uncertainty lines within the data points. (units: mm3)
* uFn→The uncertainty in the normal force for each experiment. (in Newtons)
* ud→The uncertainty in the distance for each experiment. (in mm)
* T→The temperature at which the experiment was performed. (in Fahrenheit)
* x-RH→The relative humidity at which the experiment was performed.
* x\_O2→The oxygen levels at which the experiment was performed.

## 4) “Tribometer” Field

* un→Uncertainty of the normal force for each experiment. (in Newtons)
* uf→Uncertainty of the friction force for each experiment. (in Newtons)
* ud→Uncertainty of the distance of each experiment. (in mm)
* um→Uncertainty of the mass for each experiment of the sample. (in grams)
* uL→ Uncertainty of the length for each experiment of the sample. (in mm)
* pe→TBD (please ignore for now)
* po→TBD (please ignore for now)

## 3) “averagePlusStd” Field

* time→The cycle numbers
* Fn1→ The normal force of the sample. (Newtons)
* Ff1→ The friction force of the sample (Newtons)
* Humidity→ The humidity of the area when the experiments were performed (g/kg)
* X→ The average position of the stage (in terms of mm).
* MotorRev→ The direction of the motor when the experiment is performed.
* mu1→ The coefficient of friction of the sample and the tribometer.
* time\_std→The standard deviation of the time it took to complete the cycles.
* Fn1\_std→The standard deviation of the normal force for the sample.(in Newtons)
* Ff1\_std→ The standard deviation of the friction force for the sample. (in Newtons)
* Humidity\_std→ The standard deviation of the humidity for the sample. (in g/kg)
* X\_std→ The standard deviation of the average position of the stage. (in mm)
* MotorRev\_std→The standard deviation of the direction of the motor.
* mu1\_std→ The standard deviation of the coefficient of friction between the sample and the tribometer.

## 5) paramfile-don’t use

This field just provides which parameters file was used when running the experiment. The parameters file includes all calibration data for the instrument. This is not needed for the data analysis of this project.

## 6) Experiments- don’t use this

This field describes the experimental conditions used for the experiment. It is not relevant for data analysis and may be ignored by the STA 475 team.