Processing Data: The Packed Case

In this document, we describe how we processed the packed data. It is conceptually the same as the no-packing case. Do to the large amount of packed data, we split the data by interelectrode gap (2cm, 3cm, 5cm), each into its own folder. This makes it easier to inspect the data for errors, etc.

In our case, our experimental OES and circuit data is logged in each run. We record the conditions of each run (flow rate, packing size, reactor height, etc) in the title of each run. So we have three types of data: “title” data, OES data, and circuit data.

In each folder, we manually collect the title data into an excel file, ‘data\_col\_vvm’. We want to add the electron temperature data to this excel, which doesn’t exist yet. We process the OES data through Spectrum Analyzer 1.97 for each file and produce the electron temperature data.

We look over this this excel, ‘data\_col\_vvm”. We segregate data points that we think are questionable from data points that we trust into different tabs, eg “3cm\_23mm\_good” tab correspond to good, or trustworthy data, with a 3cm packing height with 2.3mm diameter packing

We then use “dbd\_to\_excel.ipynb” to cycle through all of the collected data files and extract circuit data. The code only keeps the data points kept in the tab indicated. The result is then “data\_col\_3cm\_23mm\_dbd.xlsx”. The interelectrode gap (3cm) and packing size (23mm) is replaced with the appropriate name.

This data can now be ran through the Jupyter Notebook containing the physics model. This is “Physics\_Pyomo\_EB\_Looping\_V2\_diff\_excel\_sheets\_5cm\_packed\_v3” wherein the 5cm is the interelectrode gap and will be replaced with the appropriate gap. Packed will be replaced similarly.

The Jupyter Notebook containing the physics model has 3 output files. For the case of the packed DBD with a 5 cm gap with 23mm diameter packing, the output files are:

1. “data\_from\_EB\_looping\_new\_excel\_new\_code\_5cm\_23mm.xlsx”
2. “mass\_balance\_params\_5cm\_23mm.xlsx”
3. “energy\_balance\_params\_5cm\_23mm.xlsx”

We collect all of these outputs (from the 2, 3 and 5 cm gap DBDs) into the folder “collected\_output\_files\_packing”. All of the excels named “data from EB looping…” were combined into a single excel “data\_from\_EB\_looping\_all\_sizes\_removed\_extraneous\_dims.xlsx”. All of the excels named “mass\_balance\_params…xlsx” were combined into “mass\_balance\_params\_all\_sizes.xlsx”. All of the excels named “energy\_balance\_params…xlsx” were combined into “energy\_balance\_params\_all\_sizes.xlsx”.

Only “data\_from\_EB\_looping\_all\_sizes\_removed\_extraneous\_dims.xlsx” is used in subsequent analysis for discovering dimensionless numbers. Go to the folder “He\_code\_new”.