Master Thesis:
Optimization of a Countercurrent Hydraulic Wash Column for the Solvent Exchange of Porous Materials

To produce certain types of porous materials (Aerogels) it is required to exchange the solvent, usually water which is contained inside the gel pores with an organic solvent prior to drying. This process is a bottle neck during the production of Aerogels. In order to scale-up this process step a countercurrent hydraulic wash column was design and built. This type of columns allows a continuous process which reduces the solvent consumption and the time required to fully exchange the water with an organic solvent. On step to overcome before the successful implementation of the column is the understanding of the phenomena occurring during the process such as drag and friction forces, mass transfer and shrinkage of the gels. An empirical model will further help to develop a control model and further optimize the process.

Aim:
The aim of this project is to understand different phenomena occurring inside the hydraulic wash column in order to develop a mathematical model which represents to process.

Objective:
- Determination of shrinkage vs. concentration curves for two types of gels
- Measurement of permeability of different beds as a function of particle size and solvent concentration
- Development of a mathematical model representing the column in python.
- Determination of optimal operating parameters which increases productivity and reduces solvent consumption.

The start of the thesis is possible at any time. If you are interested, please contact me.

Alberto Bueno Morales