CHECKMATE COAGULATION-FLOCCULATION: DEVELOPING A MACHINE LEARNING MODEL TO DESCRIBE COAGULATION-FLOCCULATION DYNAMICS

SUPERVISOR
dr. ir. Juan Pablo Gallo Molina

CO-SUPERVISOR
Prof. dr. Paul Van der Meeren

TUTOR
ir. Diogo Abreu

BACKGROUND
Chemistry & bioprocess technology, Environmental technology

LANGUAGE
English

MORE INFO
Diogo.Abreu@UGent.be

Introduction

We are running out of water! Due to the decreasing availability of drinking water, the growing needs of the global population, global warming, and desertification, drinking water treatment is increasingly necessary. The coagulation-flocculation process is an essential component of the conventional drinking water treatment scheme, as it is responsible for the removal of most of the particulate material present in the water. Even though it has been used for a long time, there is still a poor understanding of the influence of operating conditions, such as coagulant type and mixing conditions, on this process.

Methodology

To tackle the current lack of knowledge of the coagulation-flocculation process, mathematical modelling can be a solution. The interactions present in this system are very complex and depend on a lot of factors, which makes the development of a model based solely on mechanistic equations very challenging. Machine Learning (ML) models, which can be easily trained to capture the dynamics of the system, can help in describing the complex mechanisms in play better than its more mechanistic counterparts.

In this thesis, you will design an experimental methodology and perform experimental work to study the relevant factors in play during the coagulation-flocculation process, such as mixing intensity, as well as physicochemical properties of the particles (e.g. size and charge properties) and of the liquid (e.g. pH and dissolved ions). You will then use the data to develop an ML model that can describe the dynamics observed in the lab.
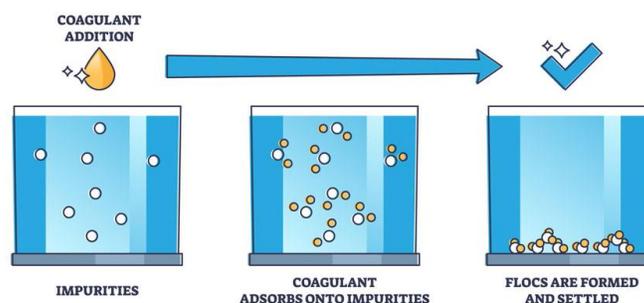

Figure 1 – Coagulation-flocculation process[1].

[1] Adapted from https://www.wcs-group.co.uk/wcs-blog/coagulants-flocculants-wastewater-treatment

Objectives of the thesis

Collect experimental data on coagulation-flocculation, and develop an ML model capable of describing the dynamics observed.