LABORATORY FOR CHEMICAL TECHNOLOGY
Technologiepark 125, 9052 Gent, Belgium

Coach	**Supervisor(s)**	**Funding**
Hamed Mohamadzadeh Shirazi	Prof. dr. ir. Kevin Van Geem	/

Investigating the fouling tendency of different feedstocks in steam cracking reaction

Aim

The aim of this PhD will be to investigate experimentally the cracking behaviour of circular feedstocks. This should provide insight on the influence of unsaturated, cyclo- and aromatic hydrocarbons on the yield and fouling tendency in an industrial steam cracker.

Justification

Light olefins such as ethylene and propylene are the most important basic chemicals for the petrochemical industry. The dominant process to manufacture them is the thermal cracking in the presence of steam. Coke deposition on the inner wall of the tubular cracking reactors is the main drawback of this process. The resulting coke layer reduces the cross-sectional area of the tubular reactors, causing a continuous increasing pressure drop. Thus, bi-molecular reactions gain ground, leading to lower olefin selectivity. In addition, the resistance to heat transfer from the furnace to the feed is increased. All the above lead to higher tube metal temperatures and eventually, to process shutdown in order to decoke the reactors. This negatively affects the desirable production and the economics of the process.

Fouling in the steam cracking furnaces is strongly influenced by the physical and chemical properties of the feedstock, but the detailed fouling mechanism and even some parameters used to estimate the risk of fouling are not fully understood. Improving the comprehension of the fouling phenomena can help more accurately predicting the behavior of potentially interesting feedstocks. The challenge of this project is to gain a fundamental understanding of parameters that influence fouling and to develop analytical, statistical or mathematical measures and methods that can be used to estimate and compare the fouling risks of different feedstocks.

Program

- Literature review of fouling in steam cracking furnaces
- Experimental investigation of coke formation tendency of different feedstocks
- Identify specific fouling component classes by spiking in real feeds using GC×GC
- Measure catalytic and asymptotic coking rate of different feedstocks (using magnetic suspension balance, MSB)

With the above information, a comparison will be done that describes the coking rate taking into account feedstock compositions.