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Experimental study for hydroconversion of fossil, plastic and renewables derived hydrocarbons

Aim

Investigate the effect of processing renewables and plastics derived hydrocarbons in hydrocracking through an experimental campaign where combined feed with petroleum fractions and traditional catalyst are used.

Justification

The hydrocarbon industry will be facing important changes in the coming years. Alternative sources of energy and chemicals, such as heavier oils, renewables and plastics derived streams will systematically replace conventional fossil hydrocarbons as the main feed. The inclusion of plastics and renewables in the hydrocarbon processing scenario can be partially managed by creating combined feeds with fossil fractions in conventional processes such as hydroconversion.

The proportion of plastics and renewables in the combined feeds is, at least initially, limited because of potential negative impacts on the downstream processing. In in the case of renewables the main challenge is its high content of oxygenated compounds that affects the oxidation stability of final products. In the case of plastics derived hydrocarbons, the diversity of the used feeds for its production, normally via pyrolysis, ends up in a wide molecular diversity whose effect in hydroconversion processes needs to be further investigated.

Using an available experimental set up at the LCT, the goal of this thesis is to perform an experimental campaign where renewables and plastic derived hydrocarbons mixtures are combined with fossil fractions and processed under typical hydroconversion conditions and catalyst. With the aim of detailed 2D chromatographic analysis of feed and products, a deep understanding of the conversion at a molecular level is intended.

Program

1. Execute a design of experiments with the aim of available simulation models.
2. Perform the experimental campaign using a Robinson-Mahoney type reactor.
3. Analyze feed and product samples using 2D chromatographic analysis.
4. Calculate the mass balance for each of the experiments.
5. Interpret the obtained results using the aim of available simulation models.