Influence of biochar properties on the catalytic cracking of toluene

Wadii ARAYEDH[1], Laurent VAN DE STEENE[2], Khashayar SALEH[1], Elias DAOUK[1*]

[1]University of Technology of Compiègne, ESCOM, TIMR (Integrated Transformations of Renewable Matter), Research center Royallieu - CS 60 319-60 203 Compiègne Cedex, France

[2]BioWooEB, University of Montpellier, CIRAD, Montpellier, France

*Corresponding author: elias.daouk@utc.fr

Biochars appear to have excellent catalytic potential for cracking tar molecules. The textural properties of biochars, such as specific surface area and pore size distribution, play a major role in the catalytic potential of these materials. The aim of this study is firstly to produce biochars with different properties using physical activation methods, and then to test these biochars in order to study the effect of their properties on toluene cracking.

Therefore, the influence of the activation conditions, i.e. the conversion rate and the activating agent (H_2O and CO_2), on the textural properties of the biochar was first studied. We found that the specific surface area increased with the conversion rate. However, a compromise was found between surface development and biochar consumption during activation, with a conversion rate around 30%. In addition, we found that activation under CO_2 at 900°C favoured the development of a predominantly microporous surface, whereas activation under H_2O at 800°C favoured the development of mesopores in addition to micropores.

In the second part of the study, we showed that increasing the specific surface area of biochars improves their catalytic activity during toluene cracking. We also showed that the pore size distribution plays a major role in the deactivation of biochars. Indeed, deactivation is slowed by the presence of a mesoporous part of the biochar surface.