Environmental Engineering and Management Journal September 2011, Vol.10, No. 9, 1325-1334
http://omicron.ch.tuiasi.ro/EEMJ/

"Gheorghe Asachi" Technical University of Iasi, Romania

PARAMETERS EFFECT ON THE PRODUCT DISTRIBUTION IN THE BIOMASS TO FISCHER-TROPSCH FUELS PROCESS

Anca Sauciuc[1*], Ziad Abosteif[2], Angela Potetz[3], Gerald Weber[4], Reinhard Rauch[3] Hermann Hofbauer[3], Georg Schlaub[2], Lucia Dumitrescu[1]

[1]Transilvania University of Brasov, Department of Chemistry and Environment, 1 Colina Universitatii, 500068 Brasov, Romania
[2]Karlsruhe Institute of Technology, Engler-Bunte Institute, Engler-Bunte-Ring 1, 76131Karlsruhe, Germany
[3]Vienna University of Technology, Institute of Chemical Engineering, Getreidemarkt 9/166, A-1600 Vienna, Austria
[4]Bioenergy2020+, Wienerstraße 49, 7540 Güssing, Austria

Abstract

The increasing of energy consumption and fossil fuel emissions (especially CO_2, SO_2 and NO_x) and the limitation of crude oil reserves, determined a growing trend toward renewable energy technologies, like solar, wind, geo-thermal energy and biomass for biofuels.
From all the renewable energies sources, biomass attracts more and more interest being a renewable resource with economic potential, which can be found all over the world, with positive environmental properties due to neutral emissions of CO_2 and low sulphur content. Biofuels obtained from biomass are becoming competitive with fossil fuels because of their environmental friendliness, availability, biodegradability, contribution to sustainable development and even economic benefits. One modern technology of producing biofuels, especially biodiesel, from biomass is Fischer-Tropsch process. The short or long chain hydrocarbons are obtained using syngas (H_2 and CO) as feedstock. For the past five decades, the syngas was provided by coal or natural gas, being a well-establish technology. Today, because of the environmental concerns, researchers are more interested in obtaining liquid hydrocarbons also from syngas produced by biomass gasification.
In this paper the Fischer-Tropsch technology that uses syngas obtained from wood chips gasification at the Combined Heat and Power (CHP) plant Güssing was investigated. The main objective was to establish the products distribution of Fischer-Tropsch synthesis over Co-based catalyst, under different temperatures (230 °C, 240 °C), and flow gas variation (5 Nm^3/h and 4 Nm^3/h). For this purpose, during Fischer-Tropsch synthesis, the composition of syngas before and after the slurry-bed reactor was analysed and the degree of CO conversion was determined. The product distribution of Fischer-Tropsch synthesis was characterised by Anderson-Schulz-Flory plots. Reliable results of chain growth probability were obtained with temperature and space velocity variation. These results showed that temperature and space velocity are critical parameters for the Co-based catalyst productivity and the selectivity to C5+ hydrocarbons in Fischer-Tropsch synthesis.

Key words: biomass, Co-based catalyst, Fischer-Tropsch, product distribution, synthetic diesel

Received: April, 2011; Revised final: September, 2011; Accepted: September, 2011

[*] Author to whom all correspondence should be addressed: E-mail: anca.sauciuc@unitbv.ro; Phone: 0268473003