Yassir Makkawi et al., J Pet Environ Engineering 2015, 6:5
http://dx.doi.org/10.4172/2157-7463.C1.013

OMICS International
conferenceseries.com

International Conference and Expo on
Oil and Gas

November 16-18, 2015 Dubai, UAE

Bio-fuel production in a downer reactor: A computational modeling study

Yassir Makkawi and **Xi Yu**
Aston University, UK

In seeking methods to reduce the dependence on fossil fuels and reduce the CO_2 emission, considerable research and development efforts is currently focused on renewable energies to serve both sectors of transportation fuel and electricity generation. Currently, biomass contributes 10% to the global annual energy production and this is expected to considerably increase in the next decades. The biomass can be thermally treated in a controlled environment (reactors) to produce three main bio-fuel products in the form of gas, liquid and char. The nature of the dominant product depends strongly on the reactor temperature and the gas residence time. A high temperature (>650° C) and medium residence time ~2 s favors the formation of gas (gasification), while a low temperature (<600° C) and short residence time <2 s in the absence of oxygen favors the formation of liquid oil (pyrolysis). In this study, a comprehensive chemical reactions model for the biomass gasification and pyrolysis is implemented in CFD software (ANSYS-FLUENT) for the simulation of the biomass conversion to fuel in a downer reactor. The proposed chemistry scheme includes reactions for devolatilization, tar cracking and a range of homogeneous and heterogeneous reaction, thus bridging the gap between biomass pyrolysis and gasification reactions in one unified model. The model has the advantage of being computationally fast and easy to implement as a user defined function (UDF) in wide ranges of CFD commercial software, hence, benefiting both academic and industry sectors. Finally, based on the model predictions, the study present concluding remarks on the potential of the proposed process for industrial scale processing and recommend optimum conditions for a targeted product (i.e., liquid oil, gas or char).

Biography

Yassir Makkawi has obtained his PhD in Chemical Engineering at Heriot-Watt University in Edinburgh (2003). Earlier, he has worked as a Process Engineer for eight years, serving the oil and gas industry sectors in the Middle East. His first academic post was at Heriot-Watt University, where he has worked as a Research Associate. He has then moved to the University of Edinburgh as a Research Fellow, then to the University of Sheffield as a Teaching and Research Fellow. He has joined the Academic Staff at Aston University as a Lecturer in 2008. His research is focused on the broad areas of particle technology and biomass thermo-chemical conversion. He has particular current interest in wet suspension and particle-particle interactions, experimental and Computational Fluid Dynamic (CFD) modeling of biomass gasification and pyrolysis, fluidized bed reactors, adsorption for gas separation and purification.

y.makkawi@aston.ac.uk

Notes: