

Supervisor`s reference on M.Sc. Juan Carlos Beltrán Prieto

Dissertation thesis: Treatment of glycerol fraction.

Biodiesel production from vegetable oils and animal fats generates glycerol as a by-product of the transesterification reaction. Together with the increasing demand for biodiesel, glycerol is produced in excess quantities and its practical utilization is sought. In addition to application in agriculture as animal feed, glycerol is also used in the chemical industry for the production of epichlorohydrin. Recently, partial oxidation of glycerol to valuable products with applications in pharmacy and cosmetics has been studied intensively. Very interesting products of partial oxidation of glycerol are glyceraldehyde and dihydroxyacetone.

The control of partial oxidation of glycerol to glyceraldehyde is a very challenging task, both from the experimental and theoretical points of view. The dissertation of M.Sc. Juan Carlos Beltrán Prieto is focused on the said oxidation. The PhD student had to cope with demanding chemical analysis of a complex reaction mixture, select a suitable catalyst and apply the theory of chemical kinetics to model quantitative descriptions. To address the relevant vector differential equations, it was necessary to study special chapters of mathematical analysis, to master the basics of the theory of automated control and select appropriate numerical procedures for solving nonlinear systems. The derived quantitative relationships, which have been experimentally verified, were subsequently used for the calculation of the transfer matrices needed for the estimation of the control algorithms for partial oxidation of glycerol. The necessary experimental procedures and processing of the measured kinetic data using mathematical statistics then led to quantification the oxidation parameters and were inserted into the calculated transfer matrices.

The PhD candidate has successfully mastered the above stated tasks, published partial results in scientific journals with high impact factors and actively participated in many international conferences, where his contributions were very positively evaluated. Throughout his studies, M.Sc. Juan Carlos Beltrán Prieto worked with uncommon interest, actively fulfilled all the tasks related to his dissertation and for this reason I recommend his work "Treatment of glycerol fraction" for defense.

In Zlín, March 17, 2015

prof. Ing. Karel Kolomazník, DrSc., Dr.h.c.