Modelling the intra-particle transport phenomena and chemical reactions of olive kernel fast pyrolysis

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Abstract. In the present study the development of a mathematical model for the description of the pyrolysis of a single solid olive kernel particle and the prediction of the fast pyrolysis product yields, is presented. Kinetic model is coupled with heat transfer model. The global degradation of biomass is based on Koufopanos et al. mechanism and described by two parallel 1-order reactions. The analysis is focused on primary degradation for small particle and simulations have been carried out for a spherical particle, with radius of 175 μm. The model has been validated against experiments carried out in a laboratory wire mesh reactor, for temperature range from 573 K to 873 K and a heating rate of 200 K/sec. The results of the simulation are in good agreement with the experimental data, regarding temperature, conversion histories and product distribution of olive kernel fast pyrolysis. The numerical method applied was finite difference for the heat transfer model and Runge - Kutta 4^{th} order method for chemical kinetics model equations.

Keywords: Modelling; fast pyrolysis; kinetics; heat transfer; olive kernel; wire mesh reactor.

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