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# THERMAL SCIENCE

## International Scientific Journal

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### PARALLEL- AND SERIES-REACTION MECHANISMS OF WOOD AND CHAR COMBUSTION

#### ABSTRACT

Thermogravimetric curves in air of beech wood and char, obtained from conventional pyrolysis of beech wood at a laboratory scale, have been re-examined using different kinetic models. Multi-step reaction mechanisms, consisting of either four (wood) or two (char) reactions are needed for accurate predictions of weight loss curves. In the case of wood, three reactions are linear in the reactant mass fraction whereas the fourth step presents a power-law dependence. A linear reaction for devolatilization and a non-linear reaction for combustion are used for the weight loss curves of char. It has been found that activation energies and pre-exponential factors are invariant with series- or parallel-reactions, providing changes in the stoichiometric coefficients. Furthermore, the activation energies of the two reactions occurring at higher temperatures in the four-step mechanism (wood) and those of the two-step mechanism (char) are the same. Thus, pre-exponential factors and reaction order take into account variations in the char reactivity derived from different pyrolysis conditions.

#### KEYWORDS

[combustion](#), [devolatilization](#), [kinetics](#), [wood](#), [char](#)

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