

ALTERNATIVE FUELS

(660) - (*) - KINETICS OF COMBUSTION OF LIGNOCELLULOSIC BIOMASS: RECENT RESEARCH AND CRITICAL ISSUES

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The paper examines several experimental works on combustion kinetics of lignocellulosic biomass published in the last few years. In particular, the methodological approaches used for the experimental campaigns and for the kinetic analysis are compared.

The most common experimental strategy used in the referenced works is non-isothermal thermogravimetric analysis of the raw fuels in air. Some papers adopted a different experimental strategy, consisting in performing thermal treatments of torrefaction or pyrolysis prior to the combustion tests. Few works addressed the effect of atmospheres rich in CO₂ throughout the pre-combustion thermal treatments and/or the combustion tests. The kinetic analysis has been most commonly based on popular iso-conversional methods, often implemented in thermogravimetric analysis software packages. Few works employed parallel reactions and model fitting methods.

While a general agreement is found on the patterns of mass loss and derivative mass loss curves throughout thermogravimetric non-isothermal tests, some elements of novelty and some criticalities emerge from the survey, concerning:

- the effect of heat treatment conditions, in particular torrefaction and pyrolysis
- the effect of oxy combustion atmospheres during pyrolysis and combustion.
- the variability of kinetic parameters.

These issues can limit the validity of kinetic expressions and must be critically considered when the final goal is to predict combustion rate and performance in industrial boilers.

Palavras-chave : lignocellulosic biomass, combustion kinetics, oxycombustion, methods, TGA