IMPACT OF TGA MEASUREMENTS ON ACTIVATION ENERGY (EA) DETERMINATION: CASE STUDY APPLIED TO BIOMASSES BY MEANS OF ISOCONVERSIONAL METHODS

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This work reports the results of an extended kinetic study involving both experimental measurements and modeling elaborations. It is specifically dedicated to investigate the thermal behavior of selected biomasses undergoing to torrefaction treatment.

Three biomasses representative of the *hardwood* family have been considered: *ash-wood*, *beech-wood* and *hornbeam.* As main purpose, this work is oriented to evaluate the impact of the *TGA* measurements on the final *Activation Energy (Ea)* results achieved by the adoption of the so called *isoconversional "model free" methods*, implemented on both their differential and integral version.

Considering the heterogeneous nature of the biomasses and the thermo-chemical factors conditioning the involved solid state reactions, several replicates of the TGA data set have been carried out and their impact on the *Ea* reliability has been evaluated. This has been pursued by identifying a suitable *Confidential Boundary Range* (*CBR*) of the experimental TGA data sets and, corresponding, an *Activation Energy Boundary Range* (*EaBR*) as result of an optimization procedure involving the sensibility analysis of the adopted models.

Considering the "*model free*" nature of these methods, they work without the preliminary selection of a kinetic scheme and, therefore, look particularly attractive to match the scope of this research. As further outcomes, this study provides a comparison among the models performances and a review of their application limits. Although applied to biomasses, the proposed approach could be considered as a general methodology to exploit the TGA measurements on defining reliable *Activation Energy* results.