

Experimental Analysis of the Pyrolysis Dynamics of a Single Wood Particle - Presentation of the Radiographic Technique

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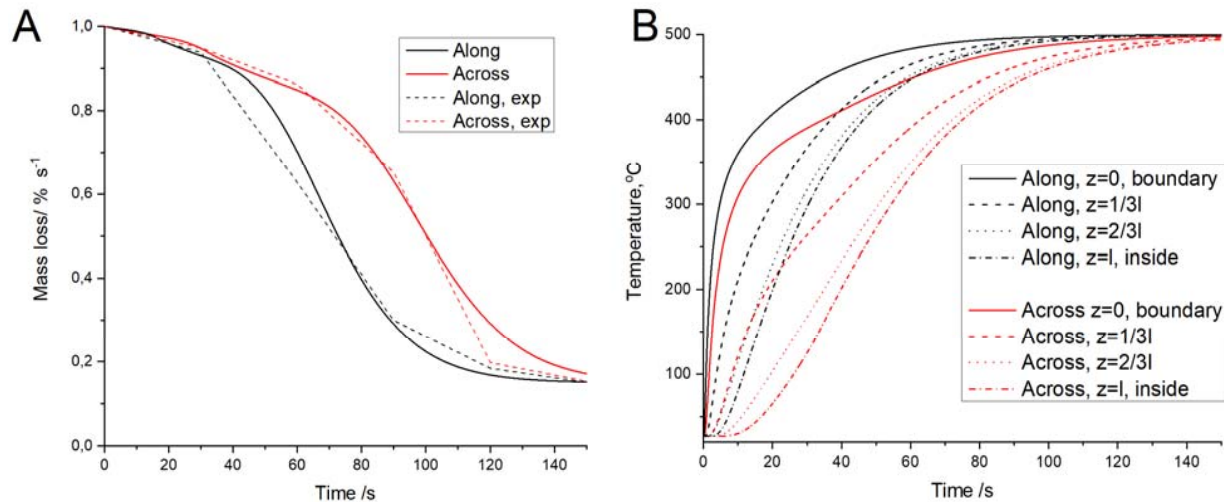
Why study the dynamics of pyrolysis of a single biomass particle?

- basic research
- understanding biomass bed pyrolysis
- studying the influence of fiber arrangement
- investigating the impact of particle shape



Basic reaserch

providing experimental data for use in mathematical calculations



Understanding biomass bed pyrolysis

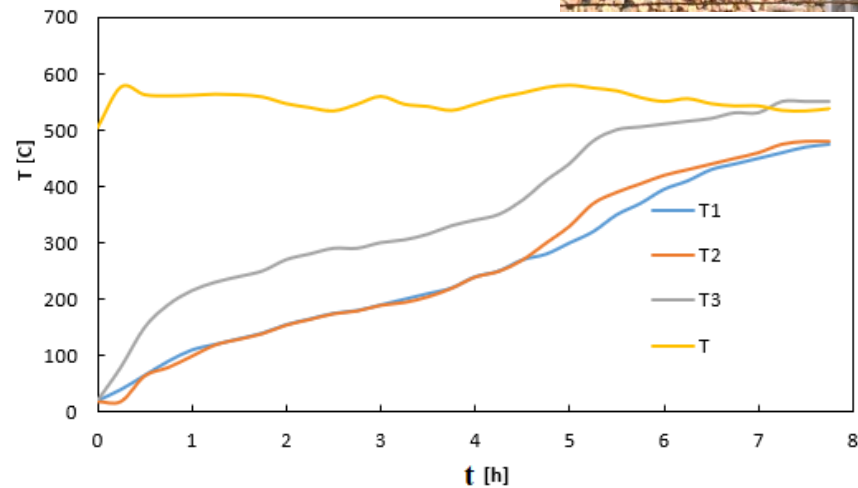
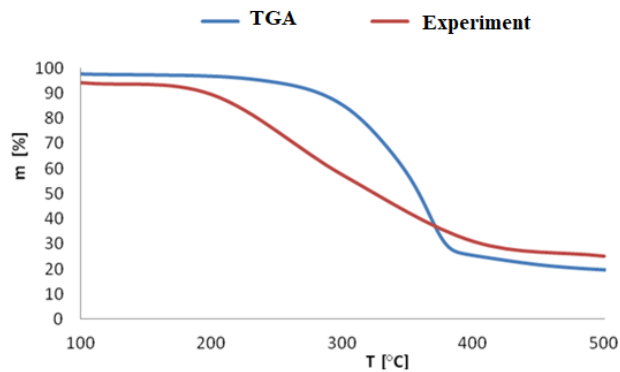
Research for industrial purposes:

- charcoal production
- activated carbon production
- tar production



Standard methods for the analysis of single particle pyrolysis

- Thermogravimetry
- Interrupting pyrolysis during the process and subsequently analyzing partially pyrolyzed samples



New methods for pyrolysis analysis using radiographic techniques

Radiography :

- Traditional Radiography
- Digital Radiography
- Online Radiography

Tomography

Radioactive Isotope (e.g., Se-75)

Various Sources of Radiation

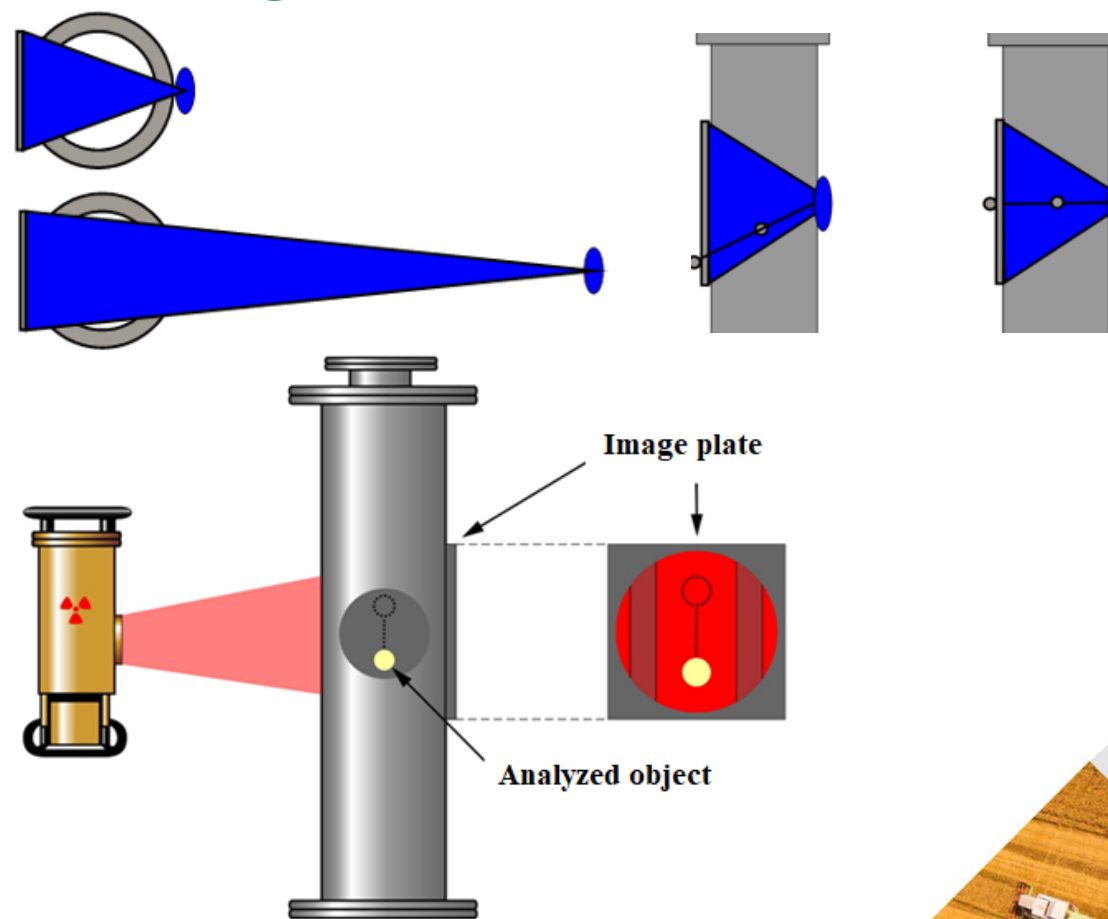


Sample Devices Used in Research



Advantages and Disadvantages of Individual Solutions

- Analysis cost
- Equipment cost
- Susceptibility to damage
- Image quality
- Analysis speed
- Image distortion



Advantages and Disadvantages of Individual Solutions

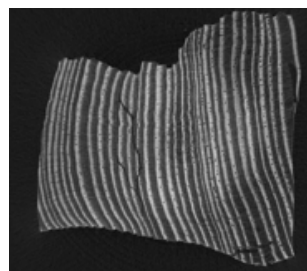
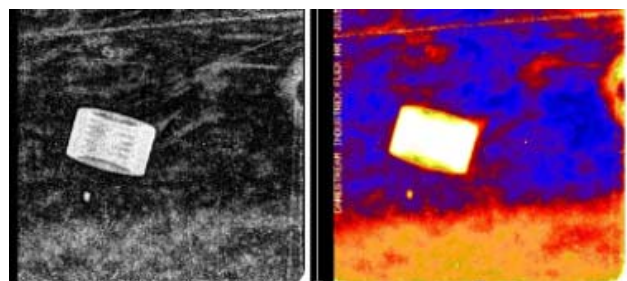
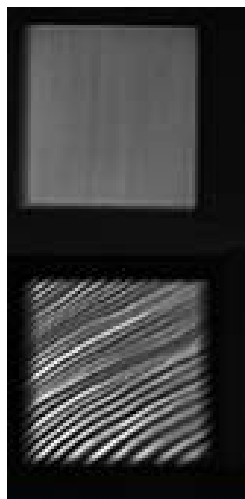
RT- the X-ray film serves three functions simultaneously: recording, presentation, and archiving

CR- separates functions by utilizing different media or devices for each within the framework of a computerized system

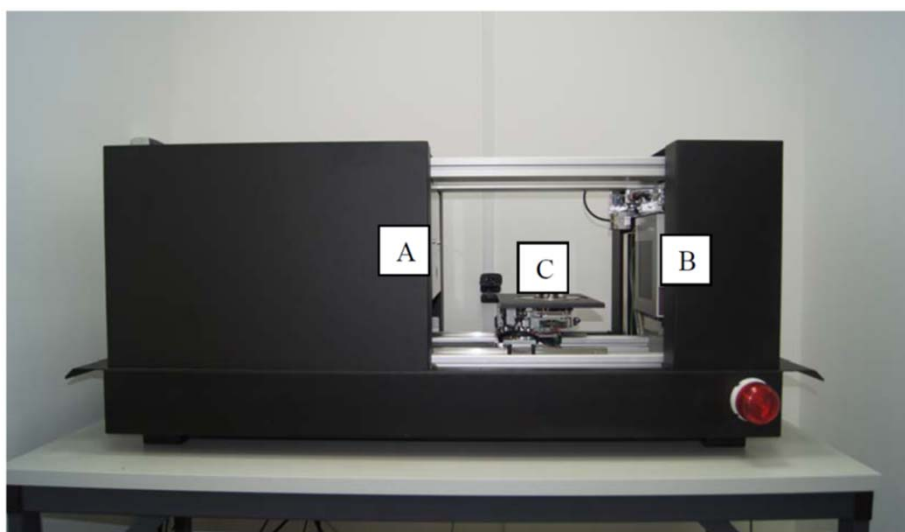
DR- The ability to take pictures at short intervals, the ability of record videos



Image quality obtained using different techniques

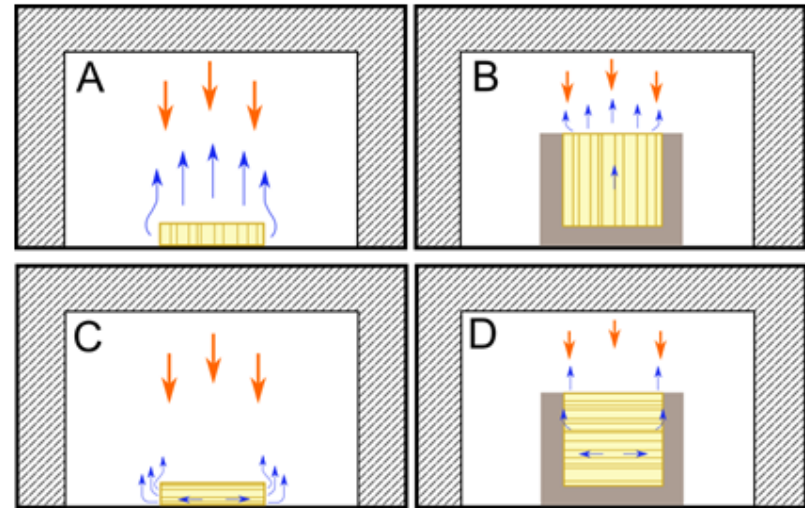
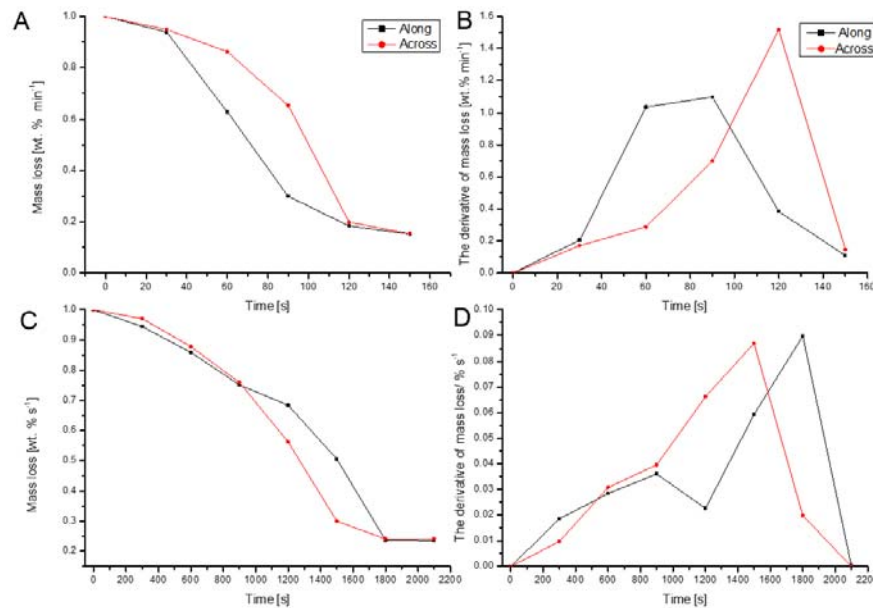


Skyscan X-ray micro-tomograph

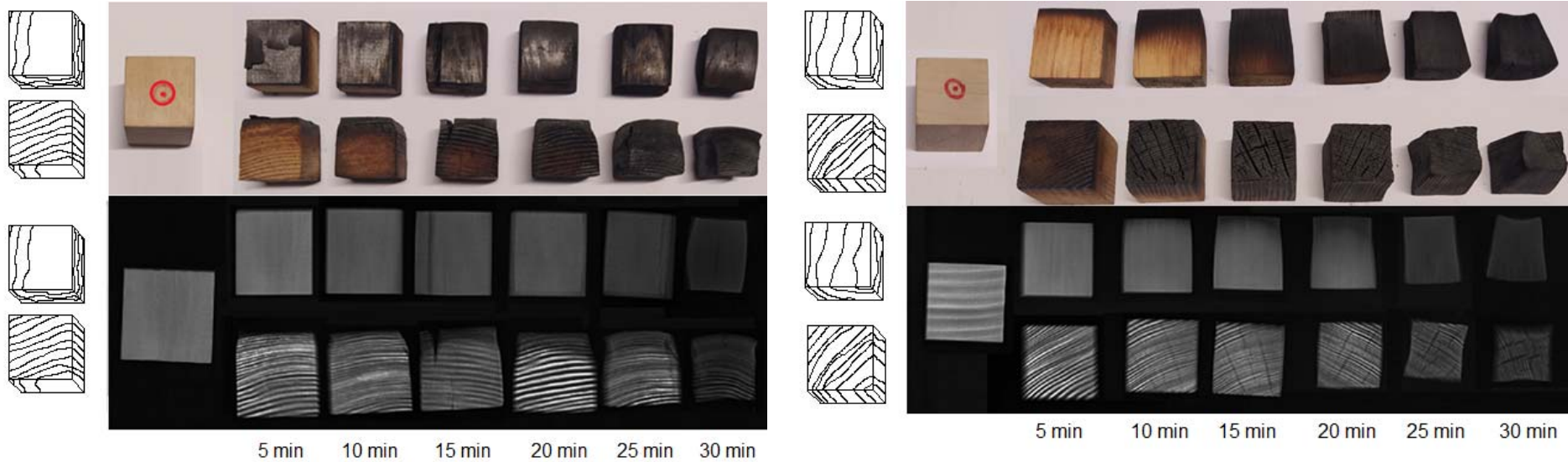


A- X-ray source, B- Flat Panel, C- Precision object manipulator

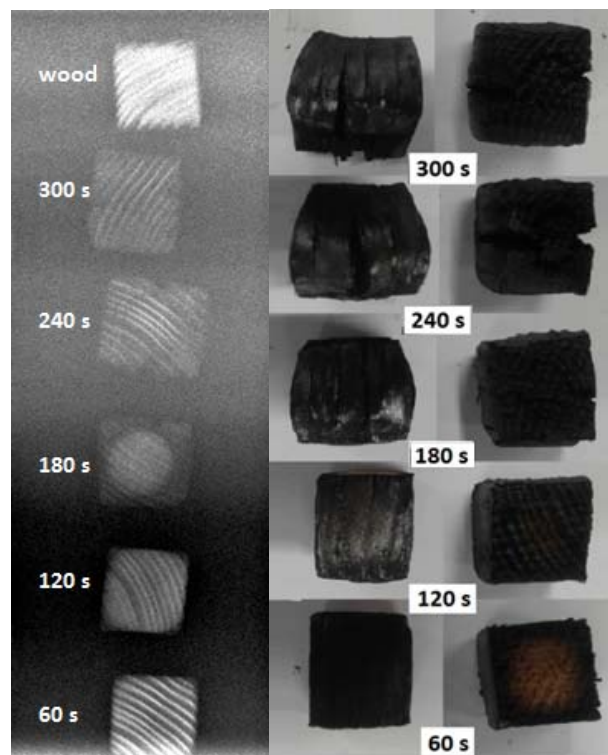
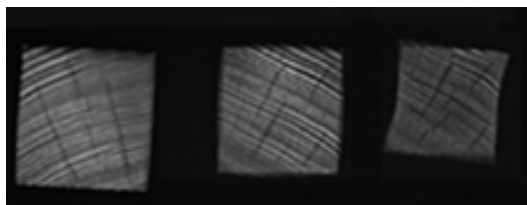
Presentation of research using the example of analyzing the impact of fiber arrangement relative to the heat source on pyrolysis dynamics



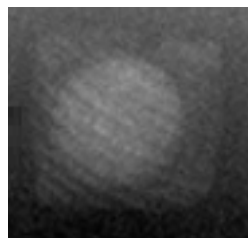
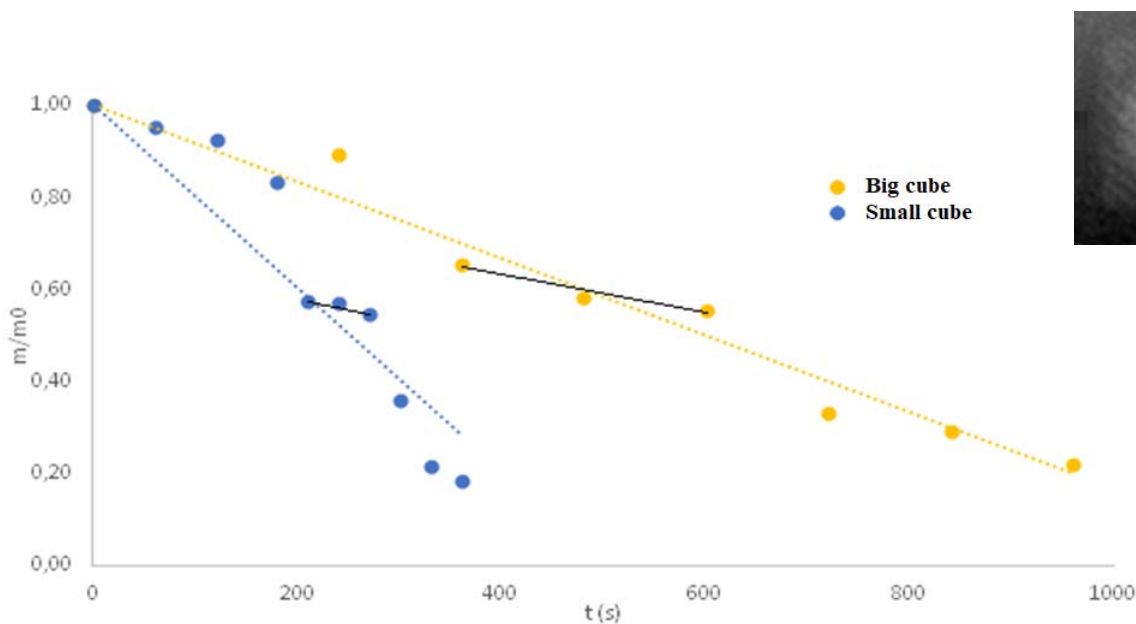
Radiographic images of wood during pyrolysis



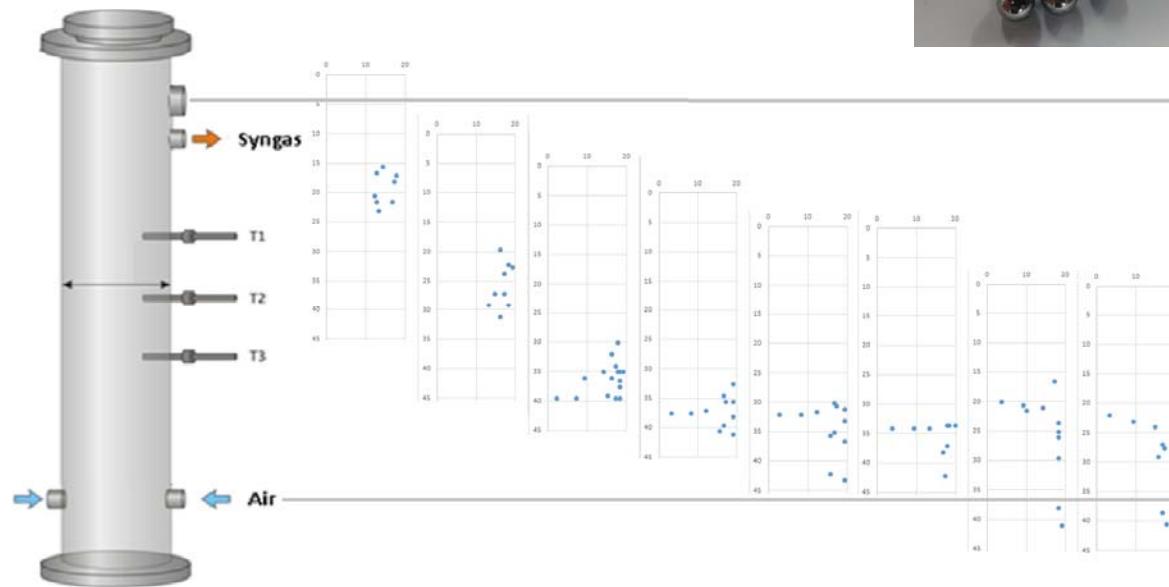
Ability to detect damage not visible to the eye



Radiographic techniques allow for a better understanding of the pyrolysis process



Further applications of radiography in the study of continuous quasipyrolysis



Conclusions

- Radiographic techniques hold significant potential for studying the thermal degradation of wood
- The use of radiography provides information about the dynamics of the process for real-sized samples (in contrast to TGA)
- The results of research on a single particle contribute to a better understanding of wood bed pyrolysis, leading to valuable insights for the industry



Thanks for attention

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