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# CHEMICAL CHANGES OF UNTREATED AND HYDROTHERMALLY MODIFIED HARDWOOD AFTER ARTIFICIAL WEATHERING

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Wood Material Science and Engineering

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# Factors responsible for wood degradation:

- **solar irradiation** (*ultraviolet (300-400 nm), visible (400-700 nm) and infrared light (700 < nm)* ),
- **water** (*rain, dew, snow, humidity*),
- **temperature**,
- **atmospheric pollution** (*sulphur oxides, nitrogen oxides, ozone, dust, etc.*).

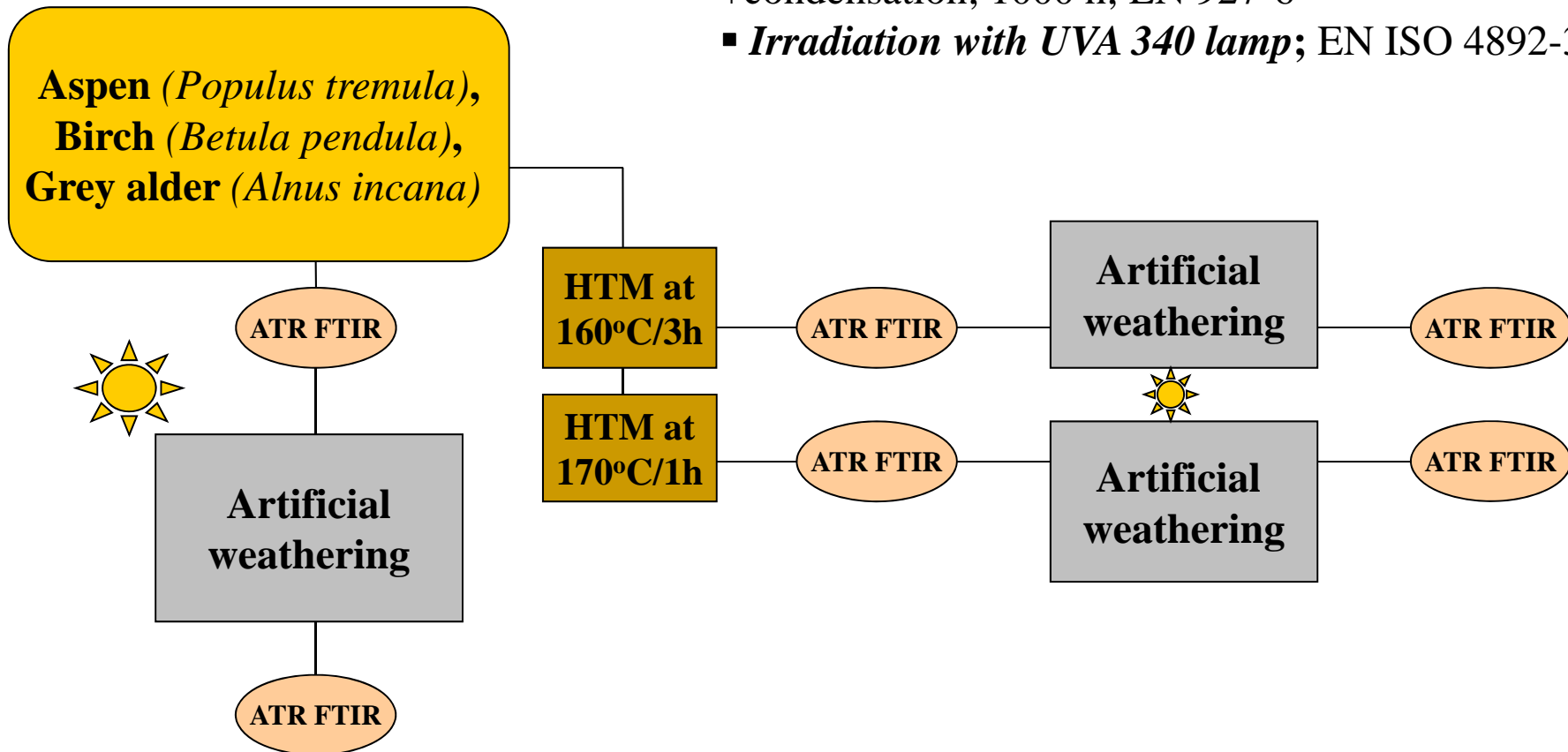


**The aim of the research - to get to know what kind of chemical changes occurs due to weathering for untreated and HTM wood.**



## Artificial weathering

- *Full weathering* - UV light + water spray + condensation; 1000 h; EN 927-6
- *Irradiation with UVA 340 lamp*; EN ISO 4892-3



**HTM** – Hydrothermal modification

**ATR FTIR** - Attenuated Total Reflectance Fourier Transform Infrared Spectroscopy

# Research equipment

**WTT Modification Pilote Device**



**Weathering Testers QUV**

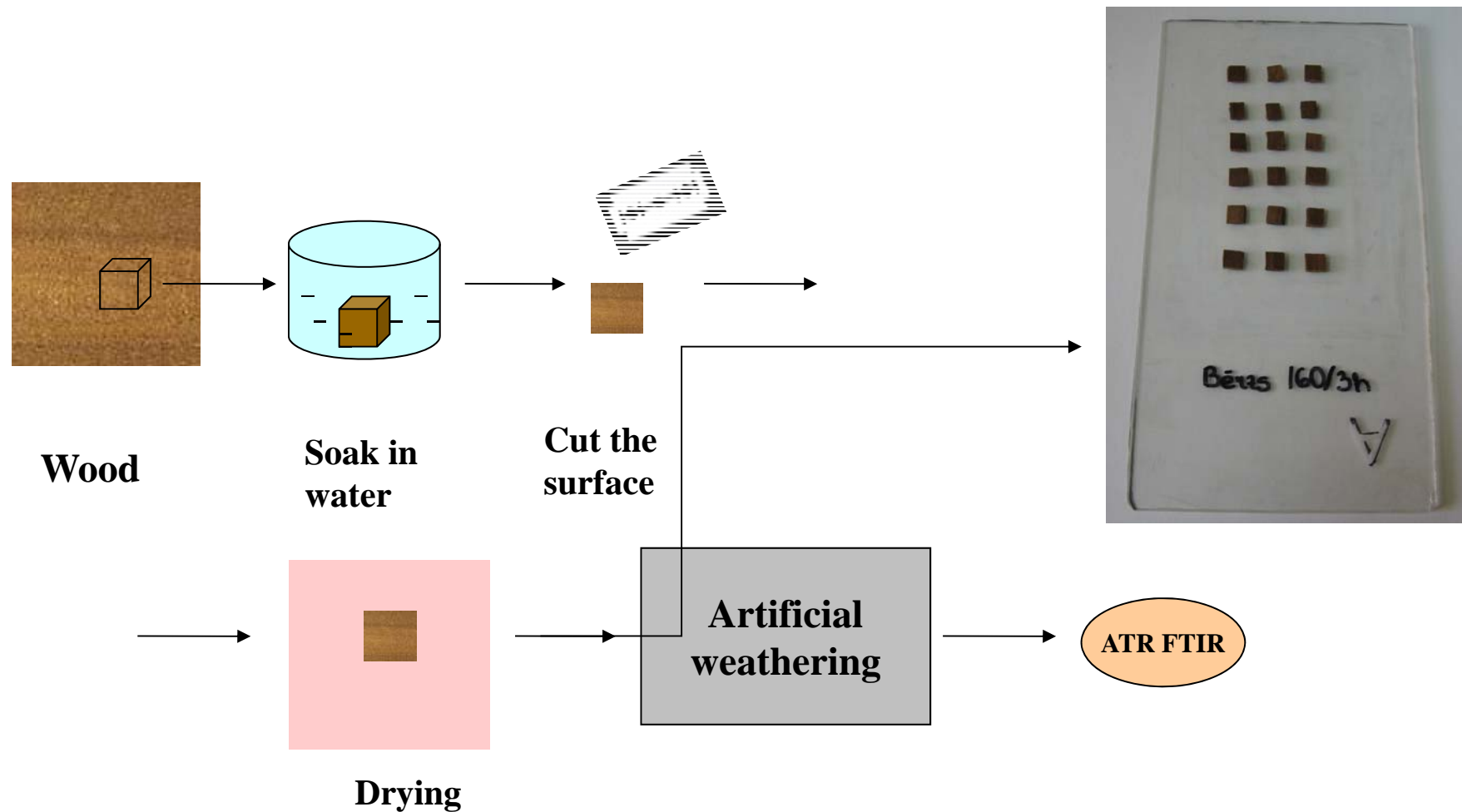
**ATR FTIR spectrometer**

Perkin-Elmer Spectrum One

Perkin Elmer Universal ATR Sampling Accessory

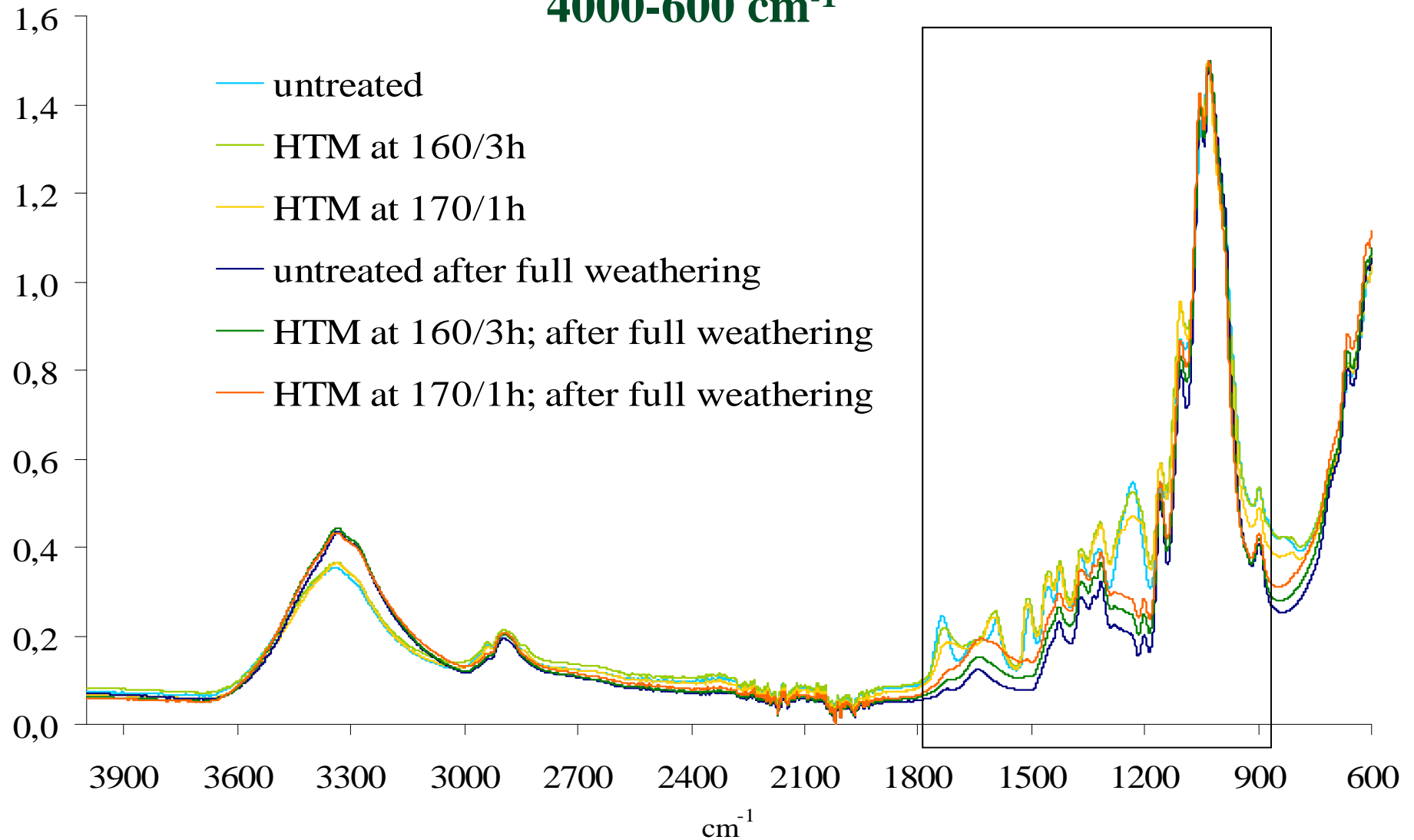


# Preparation of samples

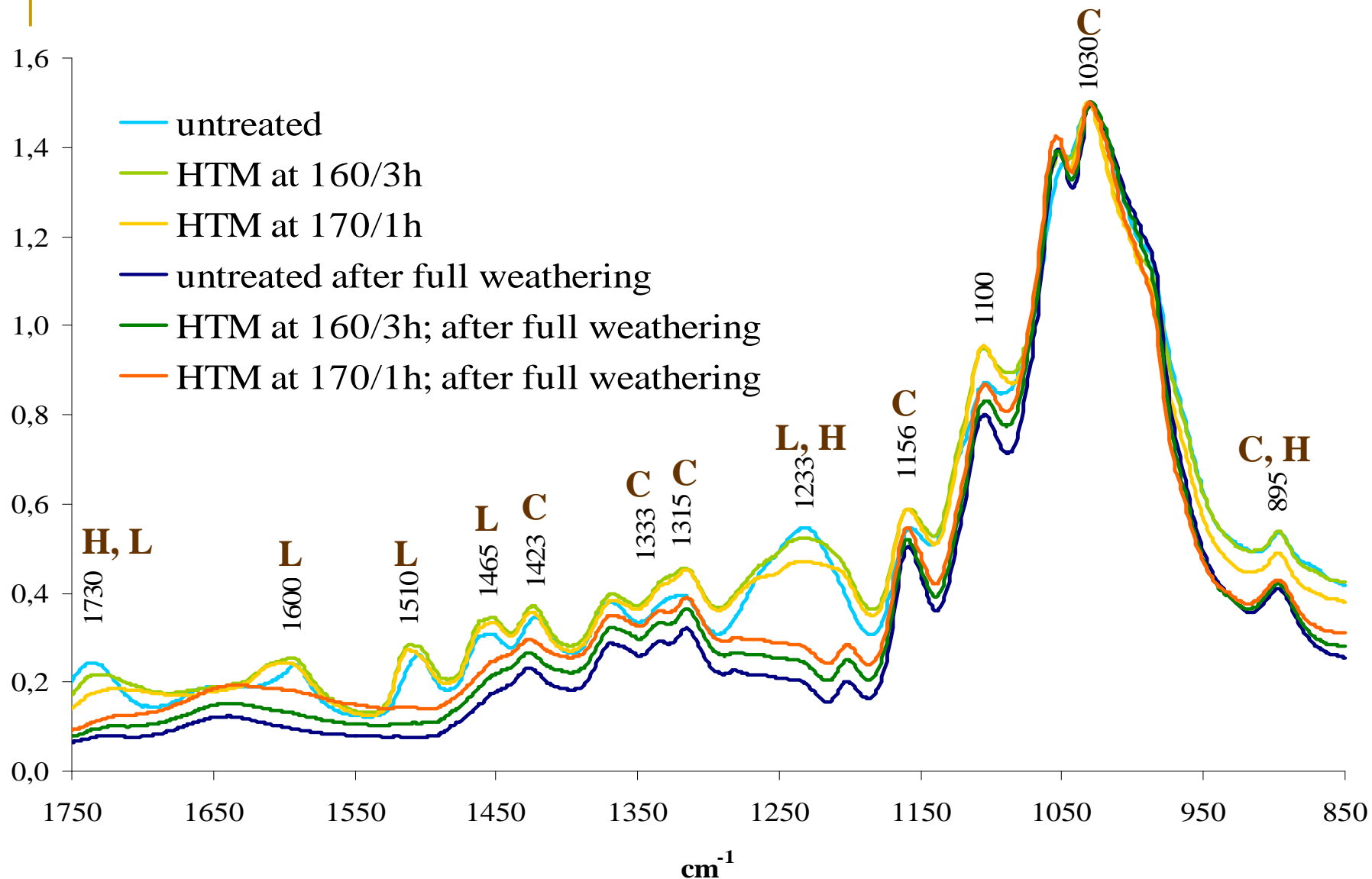


# ATR FTIR spectra of grey alder wood in the region

4000-600  $\text{cm}^{-1}$

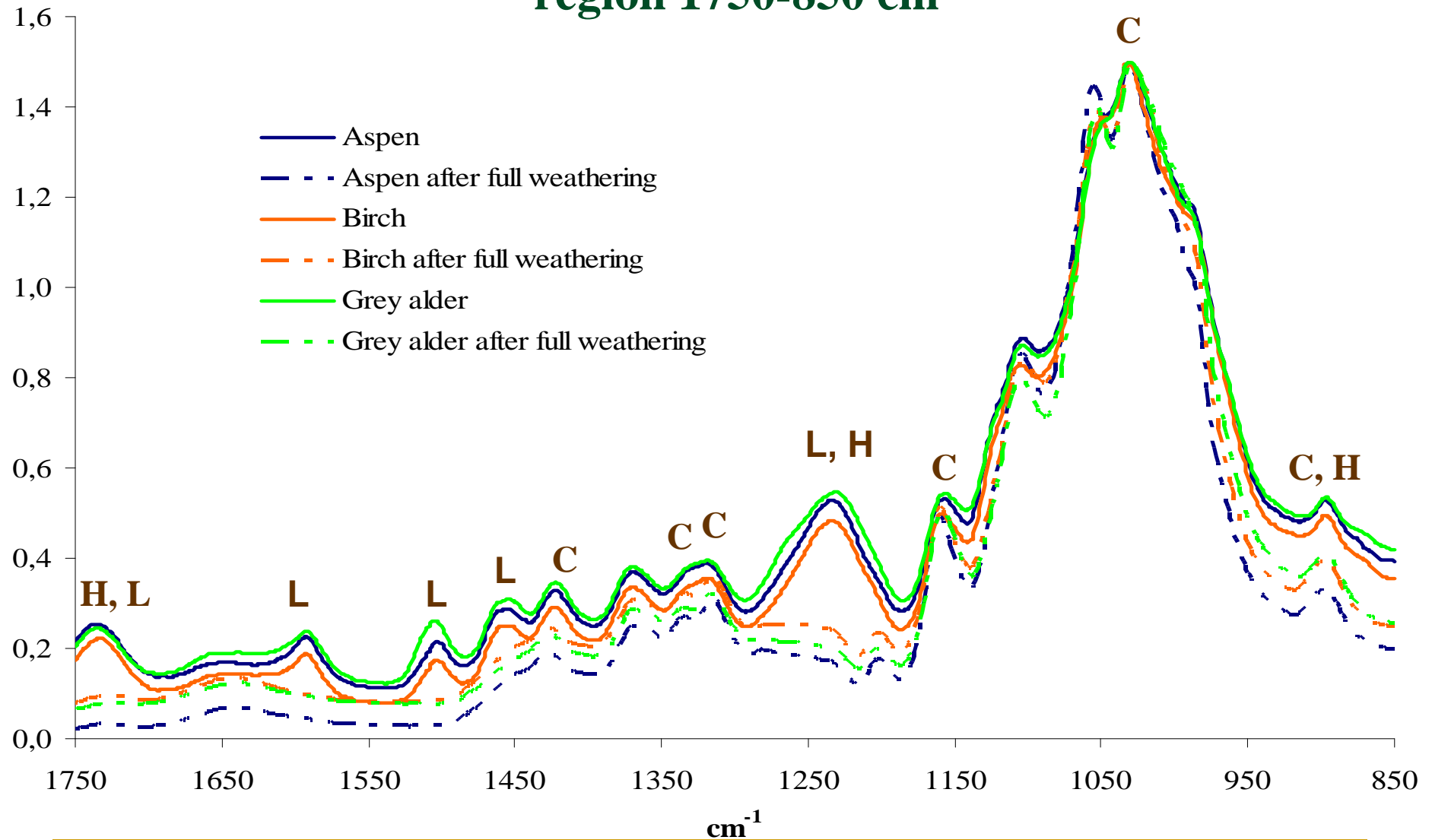


# ATR FTIR spectra of grey alder wood in the region 1750-850 $\text{cm}^{-1}$



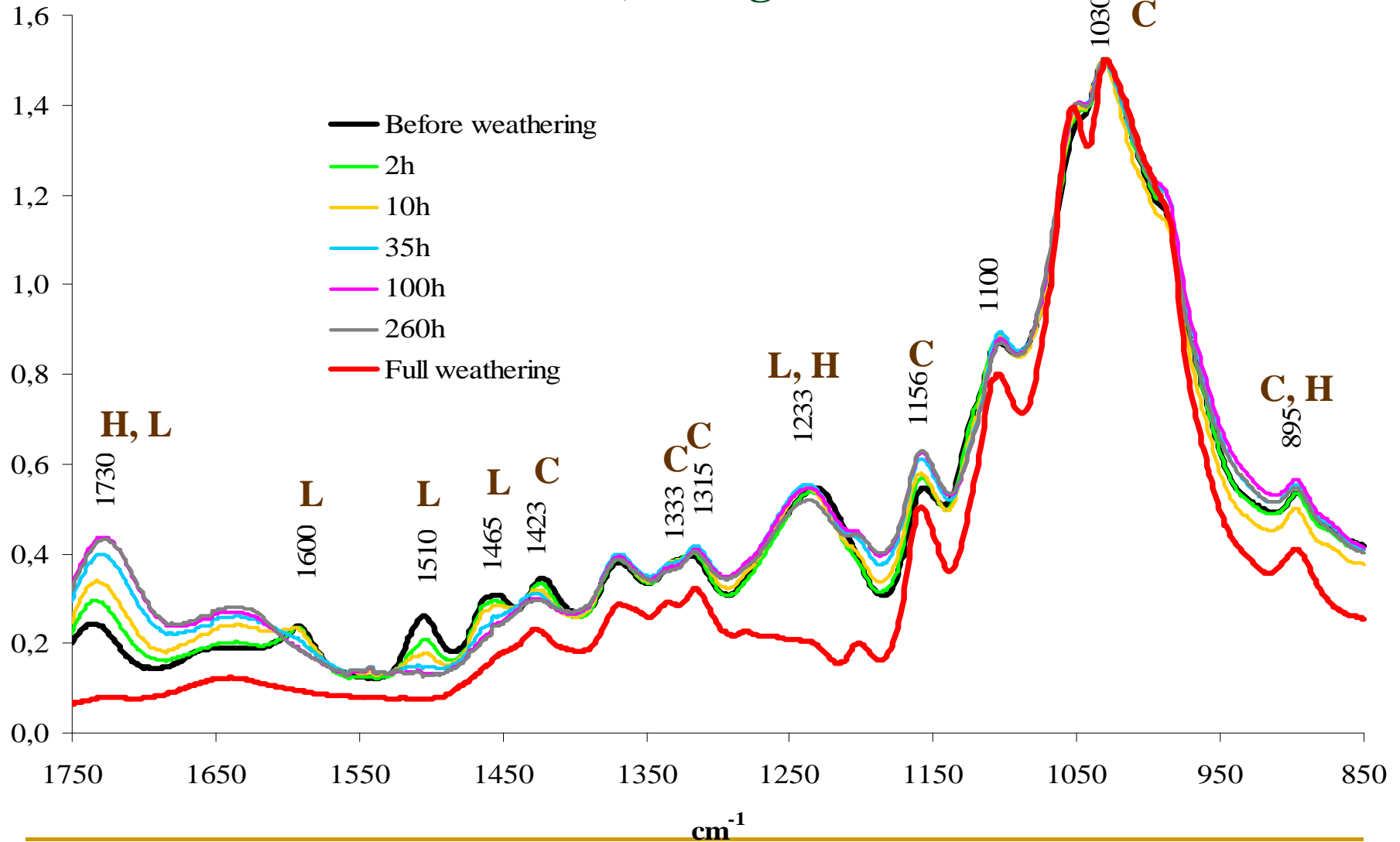
H – hemicellulose; L – lignin; C - cellulose

## ATR FTIR spectra of aspen, birch and grey alder in the region 1750-850 $\text{cm}^{-1}$



H – hemicellulose; L – lignin; C - cellulose

# ATR FTIR spectra of grey alder wood depending on time with UV irradiation (the region 1750-850 $\text{cm}^{-1}$ )



H – hemicellulose; L – lignin; C - cellulose

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# CONCLUSIONS

As a result of artificial weathering (water spray + UV irradiation) of both untreated and HTM-d wood, all three soft deciduous wood species mostly degrade lignin and amorphous cellulose, and the surface of wood becomes damaged.

Artificial weathering with UV irradiation is a gradual process, and the chemical changes after the full weathering and the weathering with UV irradiation of soft deciduous wood are different.

Soft deciduous wood after HTM needs protection from degradation processes with special coatings.

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# ACKNOWLEDGEMENT

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**Thank you for your  
attention! 😊**

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