



Oregon State University College of Forestry

Legacy of Excellence • Future of Possibilities



Durability: American Style

North American Durability Classification

- Treated wood only
- Use Categories 1 (low) to 5 (marine exposure)
- Natural durability not considered

Durability Classification (ASTM D2017)

Mass Loss (%)	Classification
0-10	Highly Resistant
11-24	Resistant
25-44	Moderately Resistant
>44	Slightly/Non-Resistant
Mass loss- in a soil block test.	

Applications

- Decking
- Outdoor living
- Utility poles (western redcedar)
- Fence posts/Ag products- especially organic growers

Important Species

- Western redcedar (*Thuja plicata*)
- Coast Redwood (*Sequoia sempervirens*)
- Alaska cedar (*Chamaecyparis nootkatensis*)
- Osage orange (*Maclura pomifera*)
- Black locust (*Robinia psuedoacacia*)



www.theplanetd.com



www.teachers.westport.k12.ct.us

Western redcedar



www.architectsinfo.com



www.woodhavenlumber.com



www.houzz.com



www.nwconifers.com

Coast redwood



www.chicagosuburbanlumber.com



www.gallery.sunnyfortuna.com



Beautiful burl furniture. All wood materials available here.
Buy the wood alone, or we can create your custom-crafted beauty!

www.redwoodsavagesales.com



www.arkive.com

Black locust



www.wooddata-base.com



www.sfrc.ufl.edu



www.tcpermaculture.com

Osage orange



www.gardeningknowhow.com



www.dreamstime.com



www.hobbithouse.com

Imports

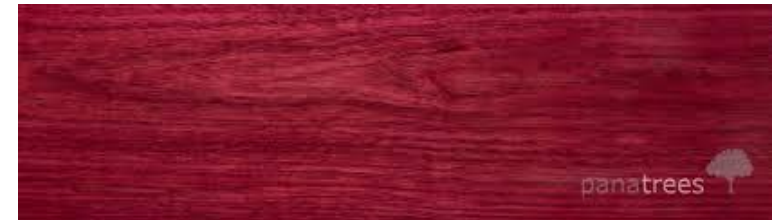


- Merbau (*Initsia bijuga*)



- Ipe (*Tabebuia* spp)

- Purpleheart (*Peltogyne* spp.)



- Angelique (*Dicorynia guianensis*)



Durability Issues

- Supply
- Variability
- Second growth
- Excessive sapwood



Why are there no standards?

- Ability to verify
- Lack of supplier interest
- No consumer concern



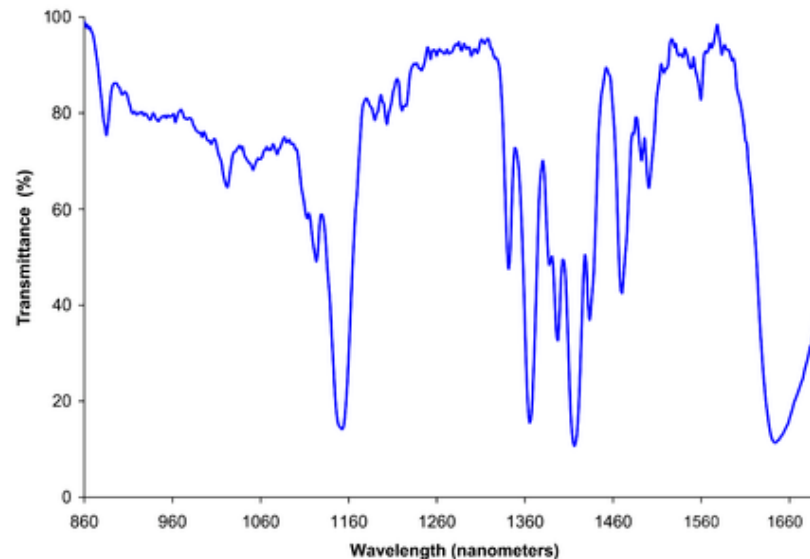
Rapid, Non destructive Durability Assessment

Approach

- Western juniper, Alaska cedar, Western redcedar
- Collect ~20 sections/species
- Cut radial transects
- Assess decay and termite resistance, extractives content
- Assess NIR and FTIR

Near infrared (NIR)

- 700 to 2500 nm
- Surface assessment of chemistry
- Uses: wood density, moisture levels, chemistry



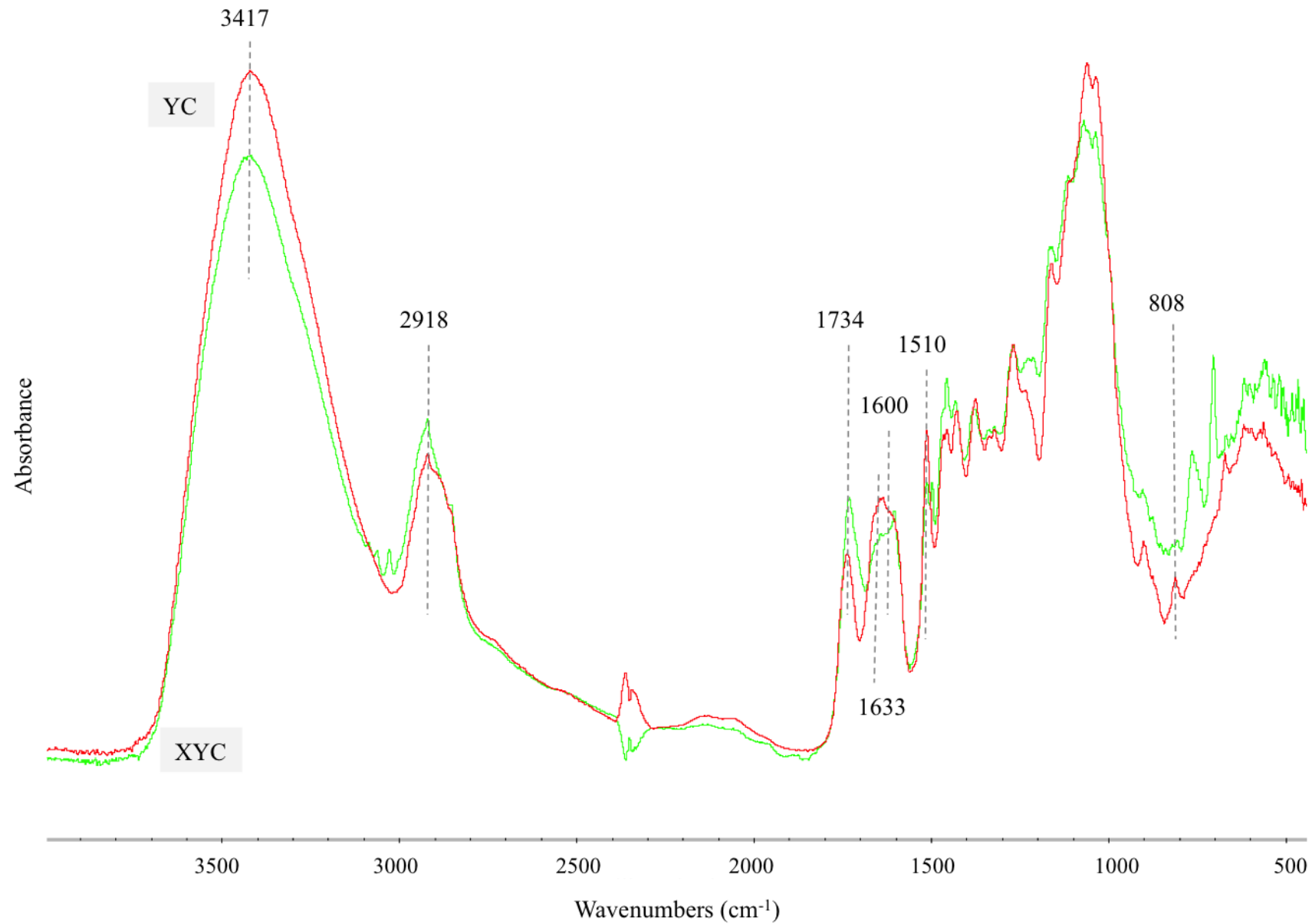
www.Wikipedia.com

Fourier Transform IR Spectroscopy

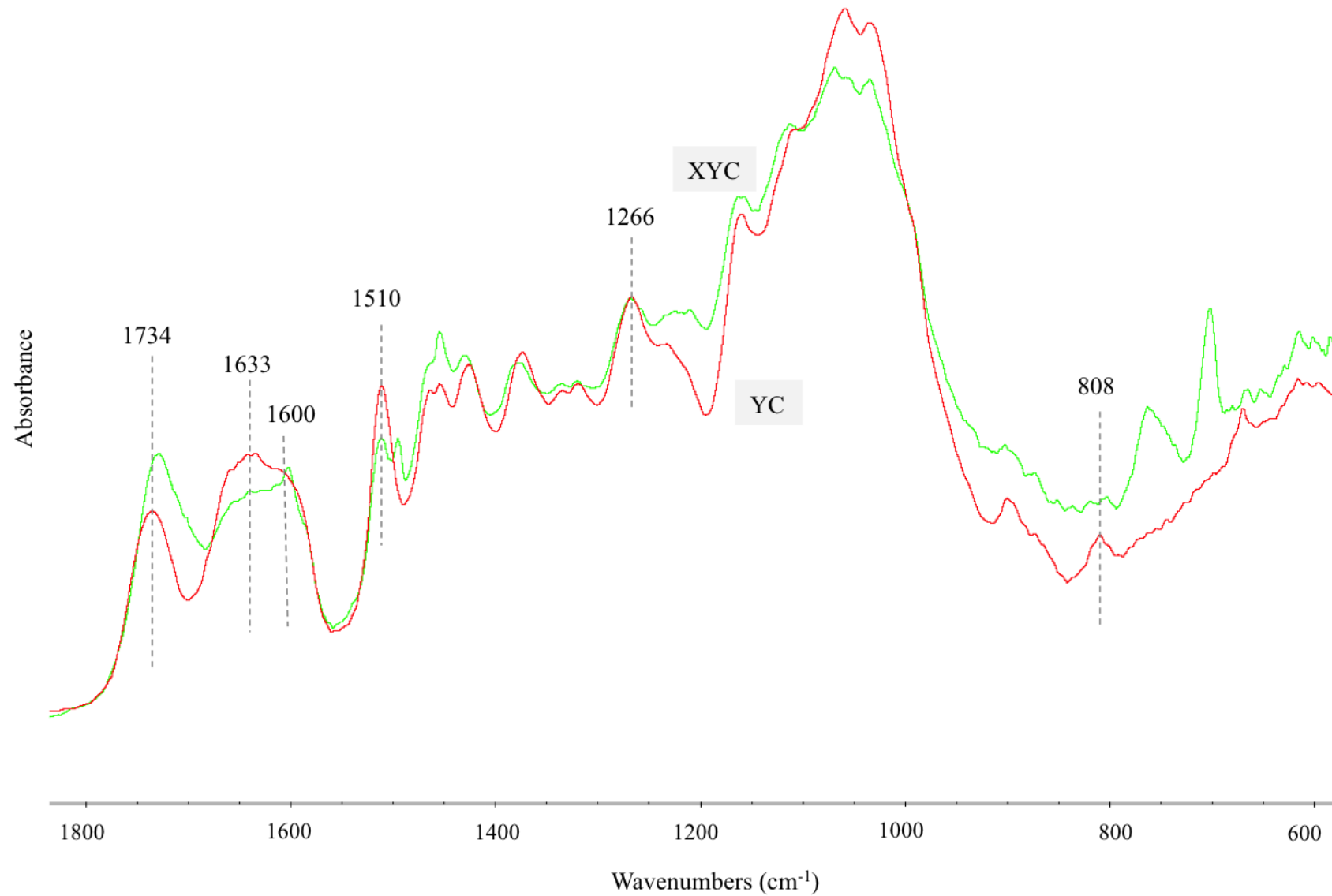
- Provides surface chemistry information
- Relatively rapid
- Non-destructive
- Technology advancing rapidly

Initial Assessment

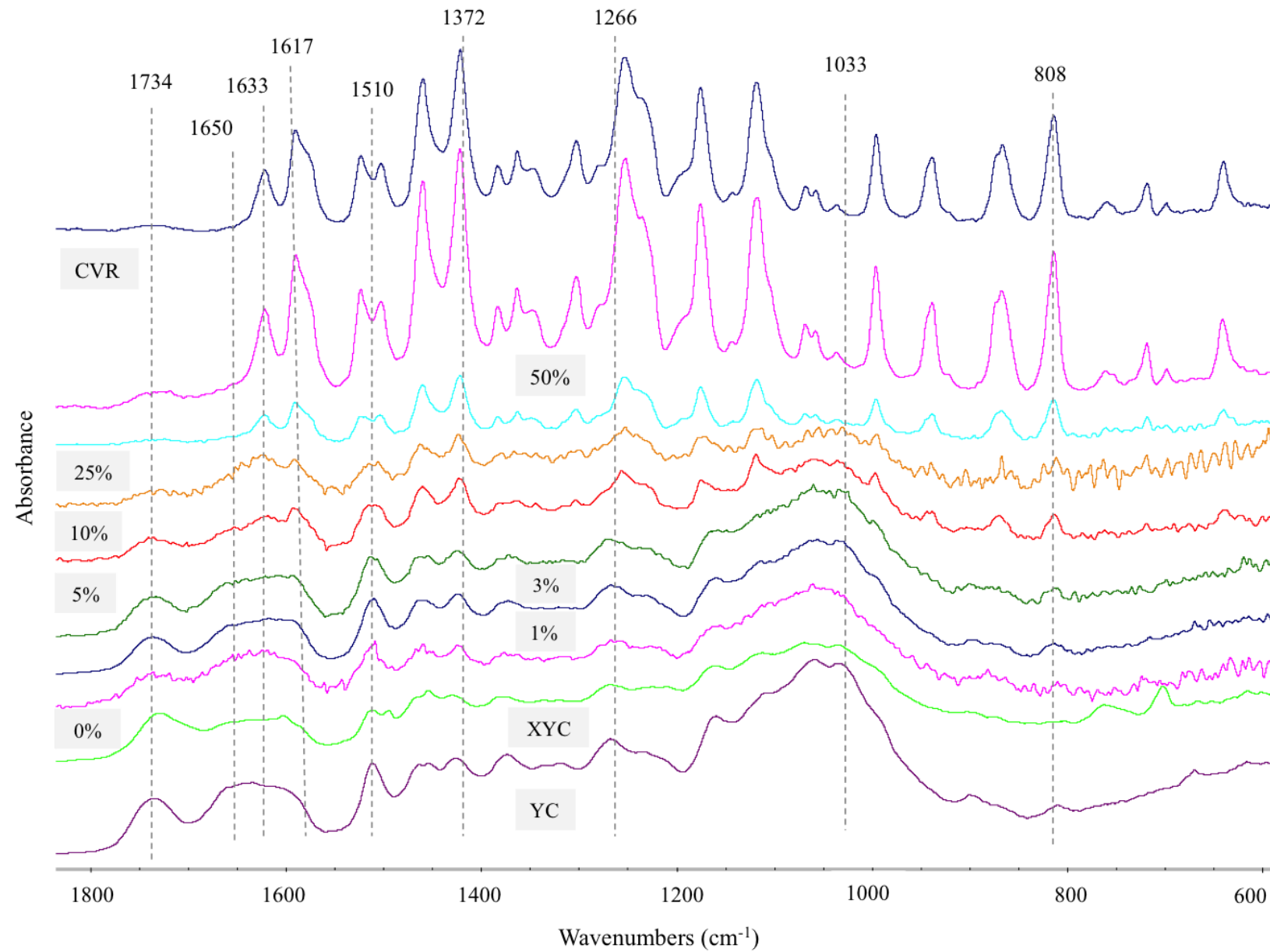
- Extractive-free Alaska cedar heartwood
- Treated with 1 to 10 % carvacrol
- FT-IR analysis using KBr pellets or ATR
- Spectra examined for evidence of changes



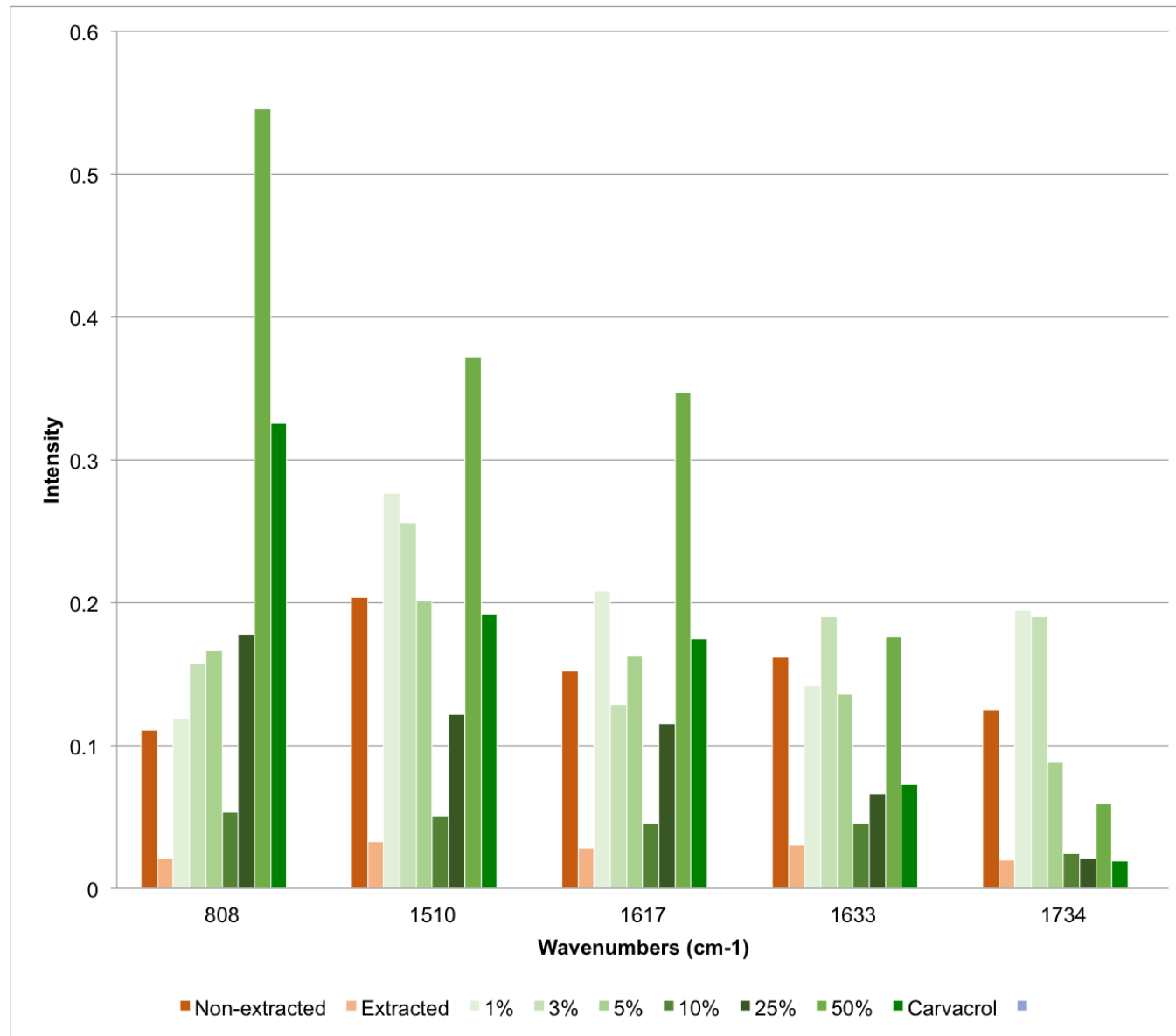
Comparison between FT-IR spectra of non-extracted (YC) and extracted (XYC) Alaska yellow cedar at the wave numbers of 4000 – 500 cm⁻¹.



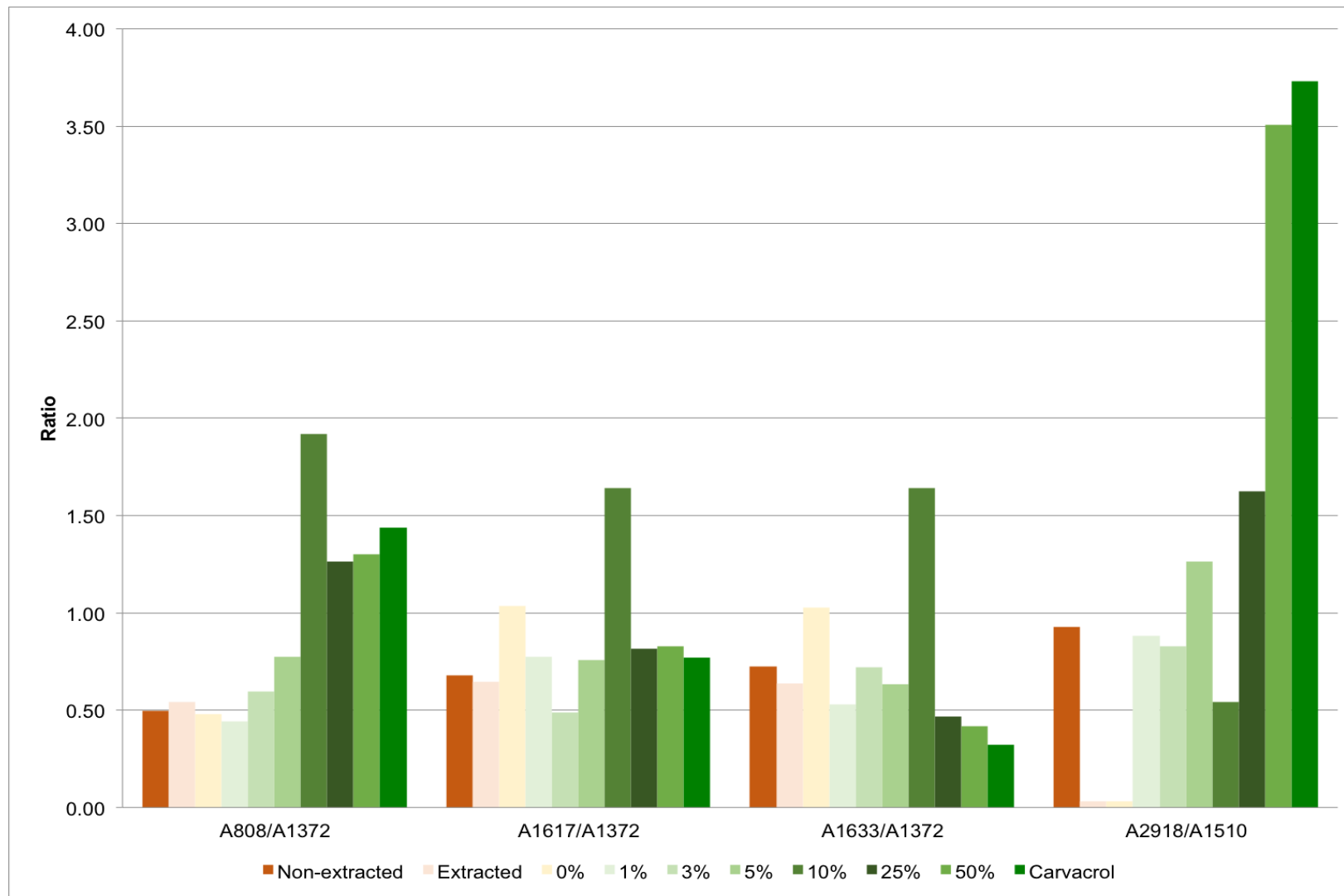
Comparison between FT-IR spectra of non-extracted (YC) and extracted (XYC) Alaska yellow cedar at the “fingerprint region”(1800 – 600 cm⁻¹).



FT-IR spectra of non-extracted (YC) and extracted (XYC) Alaska yellow cedar and non-extracted treated with 1 to 50 % carvacrol (CVR) in ethanol at the 1800 – 600 cm^{-1} .



Intensity of unextracted, extracted, and extracted Alaska yellow cedar treated with various concentrations of carvacrol at band related to extractives.



Ratio of CH wagging vibrations to cellulose and hemicellulose peaks (A_{808}/A_{1372}), carvacrol related bands to cellulose and hemicellulose (A_{1617}/A_{1372}) and (A_{1633}/A_{1372}), and aliphatic to aromatic (A_{2918}/A_{1510}).

Analysis

- Increasing carvacrol levels detected
- Need to verify ability to detect other extractives
- ATR approach was too variable
- More work underway

Ultimate Objective

- Real time sorting of wood into durability classes
- Requires calibration for each species
- Sorting could reduce the risk of early failures
- Improve consumer confidence

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