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# CINIS

# Mechanical properties of cork: effect of hydration

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# région **BOURGOGNE** FRANCHE-COMTÉ



# Context

The use of cork as sealing for wine bottles is due to its low permeability to liquids and gases, imputrescibility and good mechanical properties, particular its remarkable elasticity [1-2]. in Although being used since centuries, its properties are not well characterized.

### Cork

- Species: Quercus suber L.
- Origin: Portugal
- High quality (class 0) —
- Neither washed nor surface

### Sample preparation



# **Objectives**

- To determine the mechanical properties of cork along the radial and tangential directions (which corresponds to the compression in a bottleneck)
- To study the effect of hydration on mechanical properties of cork



Materials & Methods

## Results

### Cork under compression



## $\rightarrow$ Typical strain/stress curve: 3 regions

Buckling of cell walls

 $E = \frac{\sigma}{\sigma}$ 

Elastic region

walls

### Dynamic mechanical and thermal analysis



### *Effect of water on Young modulus*





### Differential scanning calorimetry



## Conclusion

Mechanical properties of cork are highly dependent on the hydration state of the material. While Young's modulus remained constant below 50% RH, a decrease was noticed for higher RH, due to clustering of water molecules. Altogether, our results showed for the first time that environmental parameters associated with the use of cork, can have significant impact on the mechanical properties of this wine sealer.

# References

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