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 Ph.D. thesis (2019-2022)
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High performance cellulosic materials to increase the life and reliability of power transformers

Matériaux cellulosiques de haute-performance pour accroître la durée de vie et la fiabilité de transformateurs de puissance

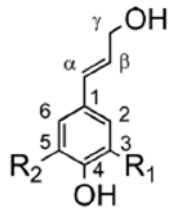
Context

Research on the chemical and physico-chemical properties of insulating paper to:

- Improved dielectric performance
- Improving durability of the insulating paper

Currently, two initial studies are ongoing:

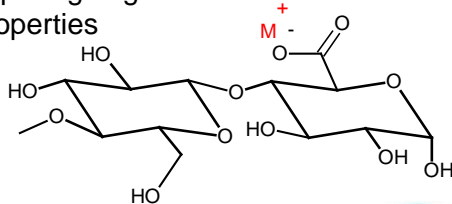
- Study of the role of lignin in methanol production during paper ageing



G: $R_1=OCH_3, R_2=H$
S: $R_1=R_2=OCH_3$
H: $R_1=R_2=H$

With the use of lignin model compounds

- Study of the role of metallic cations in paper ageing and in its dielectric properties



Through ion exchange experiments

Funded by



Objectives

Improving durability of the insulating paper:

Understanding the aging process

- To study the influence of lignin on paper dielectric properties
- To investigate paper pulp modifications (oxidation or reduction of cellulose and / or lignin)
- To evaluate the paper ageing resistance under electrical and thermal stress of the modified materials.

Improved dielectric performance:

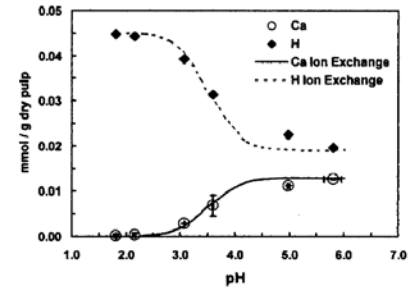
Correlating physico-chemical properties with the modification of paper

- To study the dielectric behavior of a Kraft paper with polymer additives
- To study the dielectric behavior of a three-layer structure of Kraft paper containing cellulose microfibrils
- To experiment the addition of nanofillers into the paper pulp

Methods

Modification of the physico-chemical properties of paper:

Addition of novel fonctionnal groups, addition of nano particules into the paper fibers, chemical modification of existing functional groups.



Ca²⁺/H⁺ ion exchange experiment

Assessment of dielectric and aging properties of the modified papers:

- Dielectric tests: very high voltage discharges, rapid electrical and optical metrology
- Ageing test: accelerated thermal degradation followed by physico-chemical characterizations

Conferences:

Programmed attendance at EWLP 2020