Poster 404

Cellulosic fabrics bio-finishing with natural products

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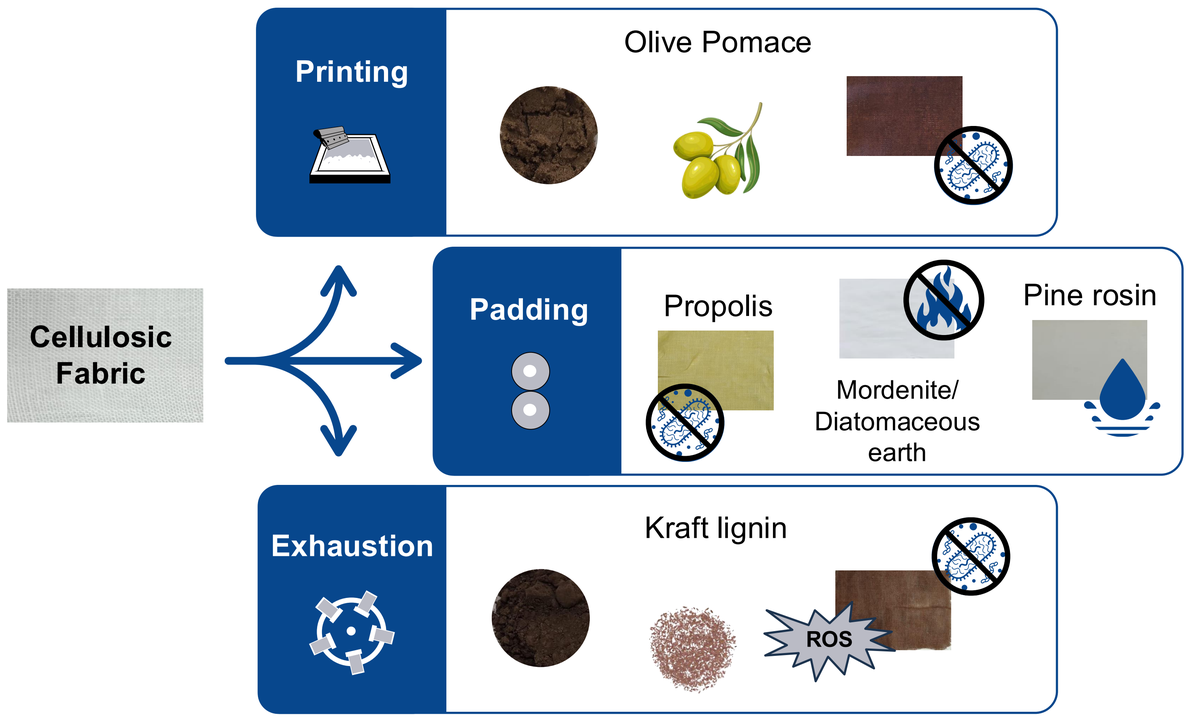
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Introduction

- **Sustainability** in the textile industry is of utmost importance;
- **Greener processes** using less harmful chemicals, water, and energy are warranted;
- A strategy to diminish these consumptions is based on the use of **organic compounds**:
  (i) Extracted from Nature | (ii) Extract produced as residues from other industries;
- In this work, **cellulosic fabrics** were functionalized with natural compounds to impart several properties.

Results

Propolis (a byproduct of beehives), **Kraft lignin** (extracted from trees or plants), and **olive pomace** (a byproduct of olive oil production) were used to **confer antimicrobial properties** to cotton (CO), linen (CL), and hemp (CH) fabrics. Fabrics functionalized with propolis can be classified as weak disinfectants, and olive pomace fabrics are considered strong decontaminants, both against *Staphylococcus aureus.* CH/KL fabrics have **excellent antioxidant activity** and can be classified as weak disinfectants against both tested bacteria (Figure 3). **Diatomaceous earth** (DE) and **mordenite zeolite** (MOR) (SiO_2-based natural compounds), in combination with biopolymers **sodium alginate** (ALG) and **chitosan** (CHI), achieved **flame retardance** up to 62%. Pine rosin (residue from the paper industry) was used to obtain a fluorocarbon-free **hydrophobic fabric**, with contact angles of 124.0±5.8º (water) and 136.0±5.2º (diiodomethane), with low surface tension values (9.1 mN/m).



Antimicrobial Finishing

(a) Propolis (Prop)

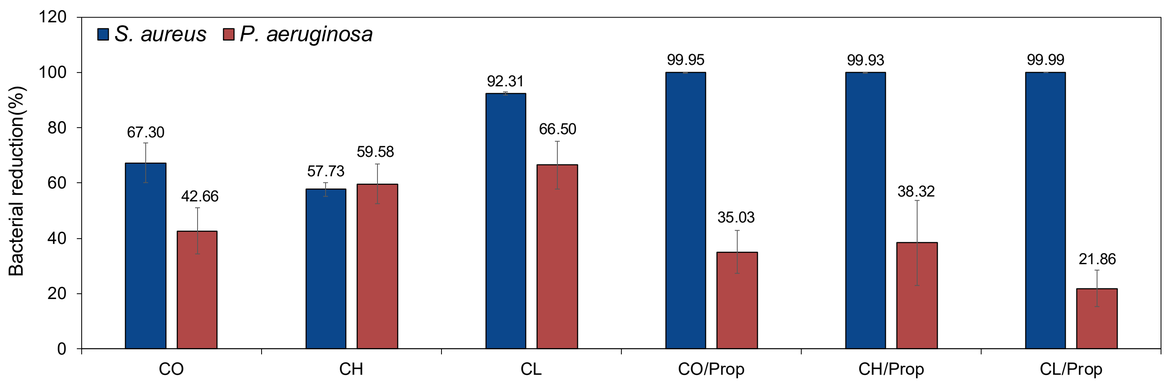


Figure 1 – Bacterial reduction of propolis functionalized fabrics against *S. aureus* and *Pseudomonas aeruginosa*.

(b) Olive Pomace (OP)

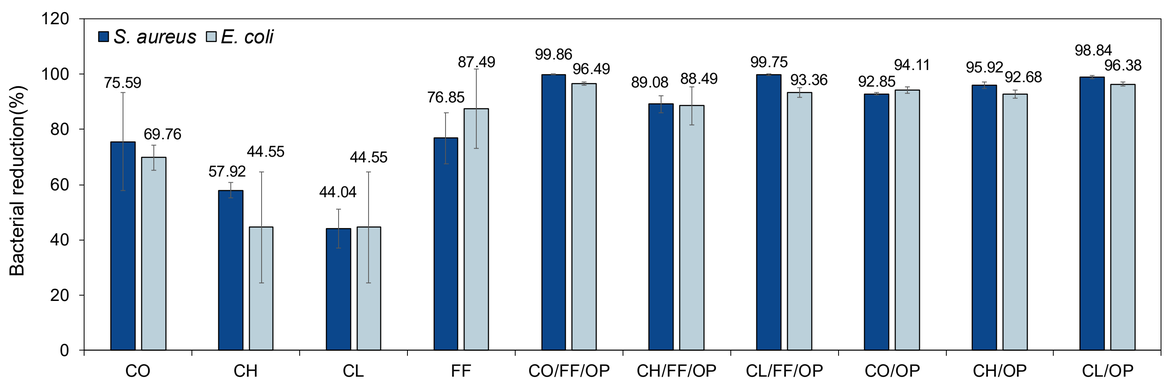


Figure 2 – Bacterial reduction of olive pomace, with and without commercial thickener FF, functionalized fabrics against *S. aureus* and *Escherichia coli*.

(c) Kraft Lignin (KL)

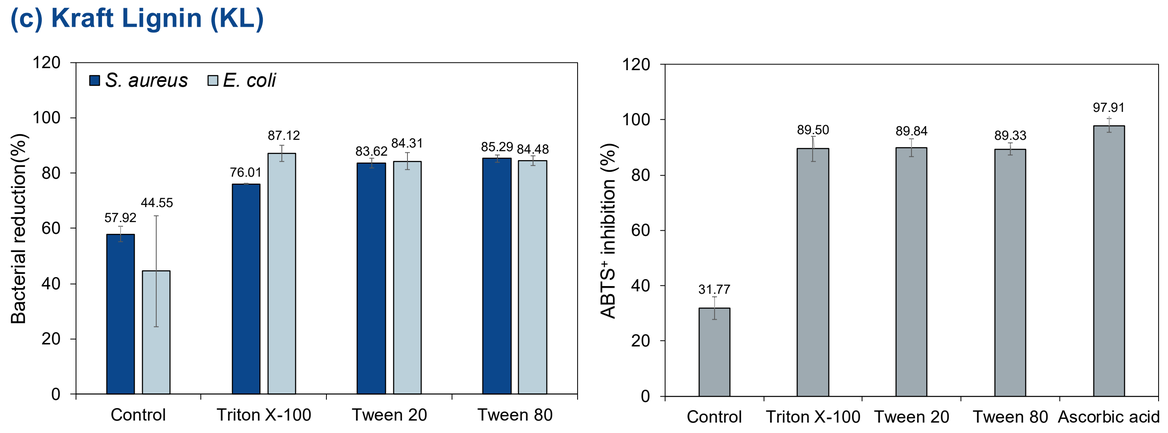


Figure 3 – Bacterial reduction of kraft lignin functionalized CH fabrics against *S. aureus* and *E. coli* (left) and CH/KL antioxidant activity (right).

Flame Retardance Finishing

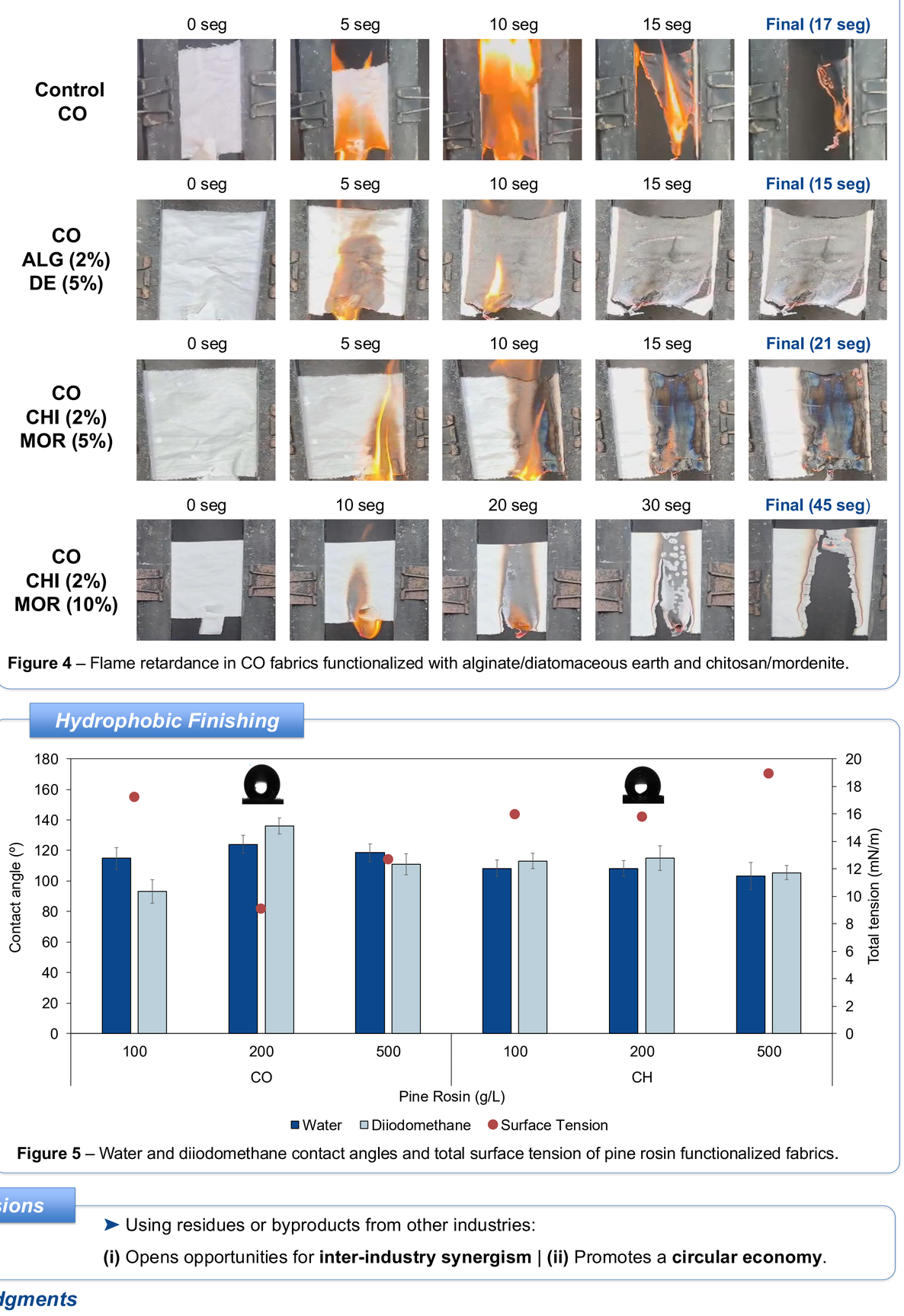


Figure 4 – Flame retardance in CO fabrics functionalized with alginate/diatomaceous earth and chitosan/mordenite.

Hydrophobic Finishing

Figure 5 – Water and diiodomethane contact angles and total surface tension of pine rosin functionalized fabrics.

Conclusions

- The results obtained in this work demonstrated the potential to (**re)use natural (by)products**;
- This approach has a considerable **positive environmental impact** on the textile industry;
- Using residues or byproducts from other industries:
  (i) Opens opportunities for **inter-industry synergism** | **(ii)** Promotes a **circular economy**.

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