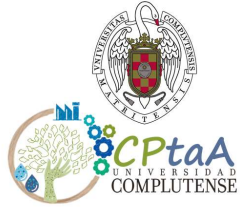


Chemical Vapor Deposition Hydrophobization of Nanocellulose-based Films and Aerogels



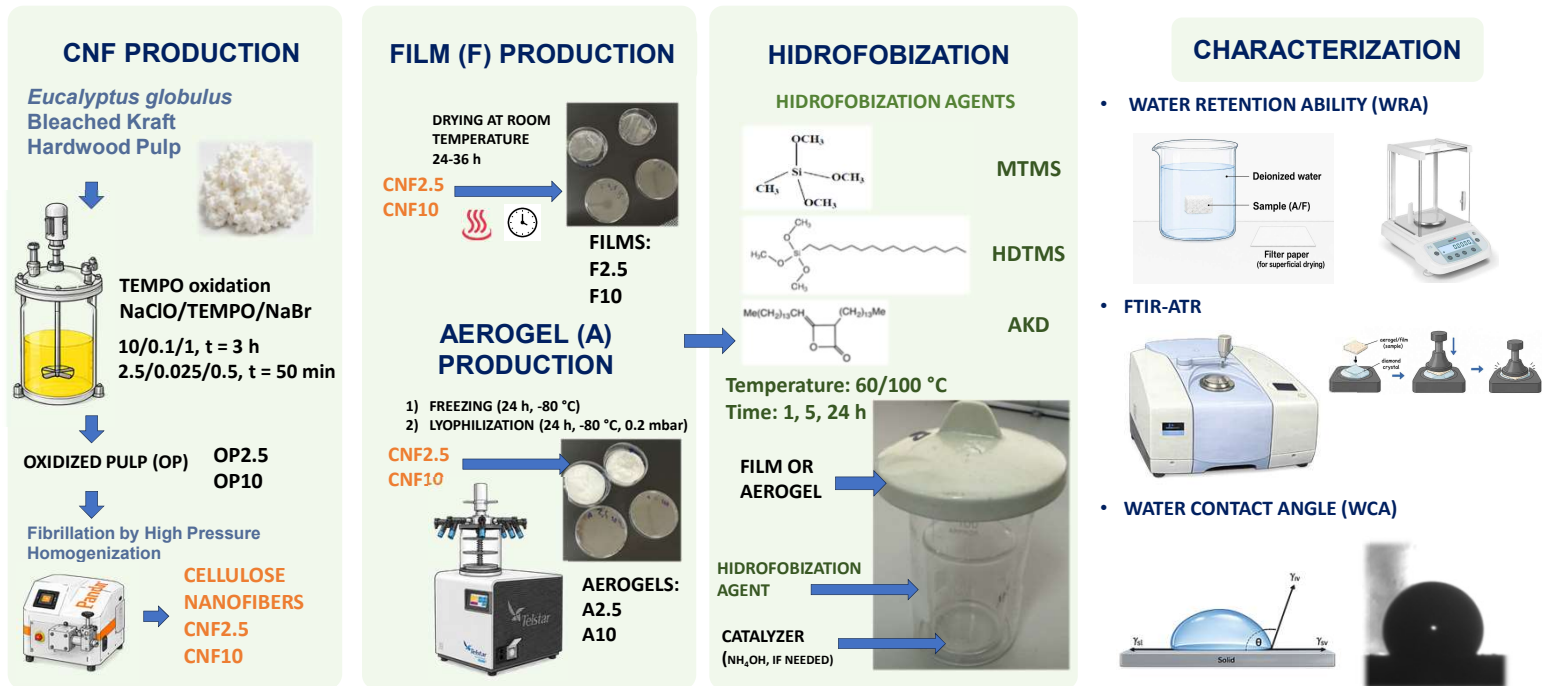
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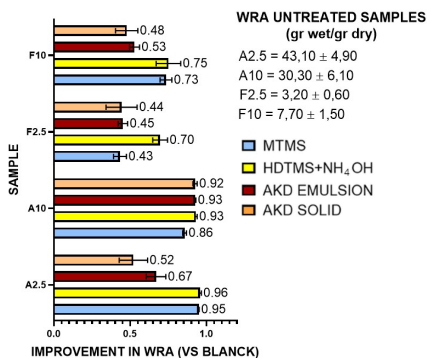


Nanocellulose (NC)-based films and aerogels are promising sustainable materials due to their low density, biodegradability, and excellent mechanical properties. Their hydrophobization can help overcome their hydrophilicity limitations.

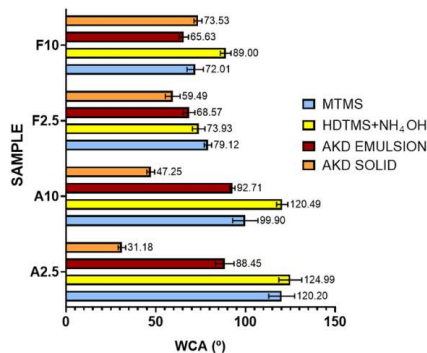
Hydrophobization can be achieved through a chemical vapor deposition (CVD) of hydrophobizing agents such as silanes, like methyltrimethoxysilane (MTMS) and hexadecyltrimethoxysilane (HDTMS), with and without NH_4OH as a catalyst, and other agents such as Alkyl ketene dimer (AKD).



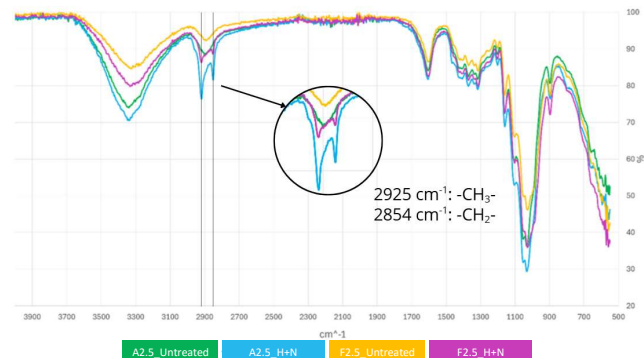
WRA (100 °C, 24 h)



WCA (100 °C, 24 h)



FTIR-ATR (CNF2.5 TREATED WITH HDTMS/ NH_4OH (H+N), 100 °C, 24 h)



Conclusions

- Results show a clear improvement in surface hydrophobicity for both F and A. Best results were obtained for A produced with 2.5/0.025/0.5.
- The WRA (24h, 100 °C) decreased in all treated samples compared with the blank. HDTMS showed the best performance, especially in films. In aerogels, silanes generally outperformed AKD, achieving up to 90% lower water retention than untreated samples.
- HDTMS with catalyst achieved the highest WCA, followed by MTMS. AKD showed limited hydrophobization, with solid AKD performing worse than emulsion AKD. Aerogels exhibited higher hydrophobicity than films.
- Aerogels exhibited stronger FTIR-ATR signals than films, suggesting better penetration and interaction of the hydrophobic agents within their porous structure.
- CVD offers a promising and versatile route to tailor the surface wettability of NC-based materials, expanding their potential use in applications such as packaging, thermal insulation, filtration, and oil-water separation.

Acknowledgments

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