# Eco-Friendly Antibacterial Patches via CMC/ZnO Hybrids Synthesized from Olive By-products

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## Résumé :

Biopolymer-based wound healing patches have attracted growing interest as they offer favorable biological properties. This work focuses on the olive stones (OS), rich in cellulose, hemicellulose and lignin [1], through the development of a wound healing patch with antibacterial properties.

Carboxymethyl cellulose (CMC) was synthesized by alkylation and etherification using cellulose extracted from olive stones, yielding a good degree of substitution (~ 0.8) and a molecular weight ranging from 244 to 676 kDa. The chemical structure of CMC was analyzed using FTIR and NMR, in comparison with a commercial CMC. The spectra revealed the presence of characteristic peaks of CMC. TGA and DSC analyses showed profiles similar to commercial CMC. These findings confirmed that CMC was successfully synthesized, making it suitable for various biomedical applications.

The second part of the study focused on the manufacture of CMC/ZnO hybrid networks by adding zinc nitrate hexahydrate, which provides $Zn^{2+}$ ions for a physical crosslinking, and zinc hydroxide ($Zn(OH)_2$) as a precursor for zinc oxides (ZnO) formation. Good physical cross-linking was obtained, with a gel content up to 88%. SEM showed a highly porous structure with a uniform pore distribution, and EDX evidenced the presence of Zn in the whole matrix. The release of ZnO was evaluated by UV measurements [2]. A cumulative release up to 5.5 mg/L was obtained. Antibacterial tests were carried out in comparison with positive and negative controls. The CMC/ZnO patches exhibited excellent antibacterial activity against S. epidermidis bacteria, as shown in Figure 1. This study highlights the great potential of CMC/ZnO hydrogel patches derived from OS as durable and effective wound healing material with antimicrobial and biocompatible properties.

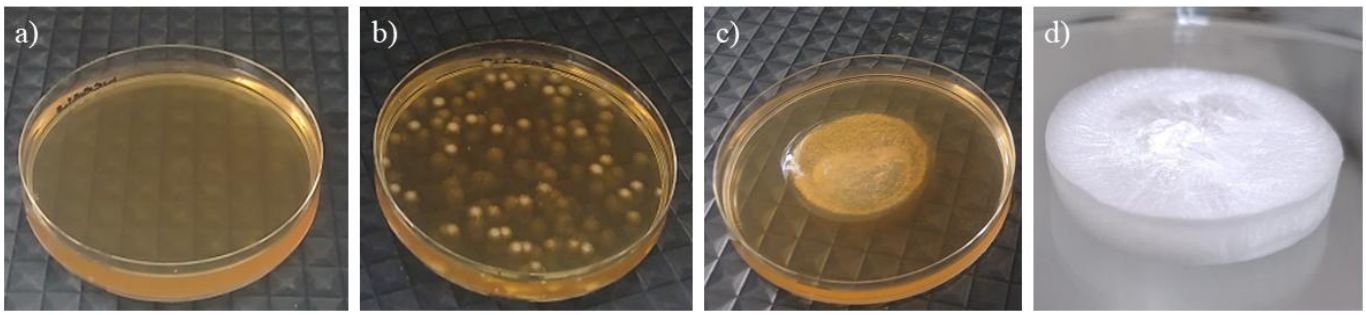


*Figure 1. Antibacterial activity of the CMC/ZnO network (d) : a) negative control, b) positive control, c) CMC/ZnO network from olive stones and d) dry CMC/ZnO patch (before bacterial exposure).*

## Références :

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