

NANOCELLULOSE AS A VERSATILE BIOPOLYMER FOR DRUG DELIVERY

Francesca Mancusi¹, Elisa Bianchi¹, Alessio Gabbani^{2,3}, Beatrice Muzzi⁴, Francesco Pineider², Costanza Montis¹, Barbara Richichi¹, Stefano Cicchi¹

¹Department of Chemistry "Ugo Schiff", University of Florence, via della Lastruccia 3-13, 50019, Sesto Fiorentino (FI), Italy, francesca.mancusi@unifi.it ² Department of Chemistry and Industrial Chemistry, University of Pisa, Pisa (PI), Italy. ³ Department of Physics and Astronomy, University of Florence, 50019, Sesto Fiorentino (FI), Italy.

⁴ CNR-ICCOM – Istituto di Chimica dei Composti Organometallici, 50019 Sesto Fiorentino (FI), Italy

Excellent chemical and physical properties, including high tensile strength, low density, biodegradability, and biocompatibility, characterize nanocellulose as a versatile biopolymer. It can be derived from various sources, such as plants, microorganisms, and algae, or from waste products like agricultural biomass.¹. The qualities of nanocellulose can be enhanced by further chemical functionalization, which also makes it more useful for drug delivery in medicine. Taking advantage of the ease of functionalization of nanocellulose, carboxyl groups were introduced and then used as an anchor point to attach Indium Tin Oxide (ITO NPs) nanoparticles. These nanoparticles are promising for photothermal therapy of tumors because of their absorption peak in the near-infrared (NIR) region around 1700-1800 nm². The realization of a selective transport system is our goal to localize ITO NPs in cancer cells and specifically treat the tumor.

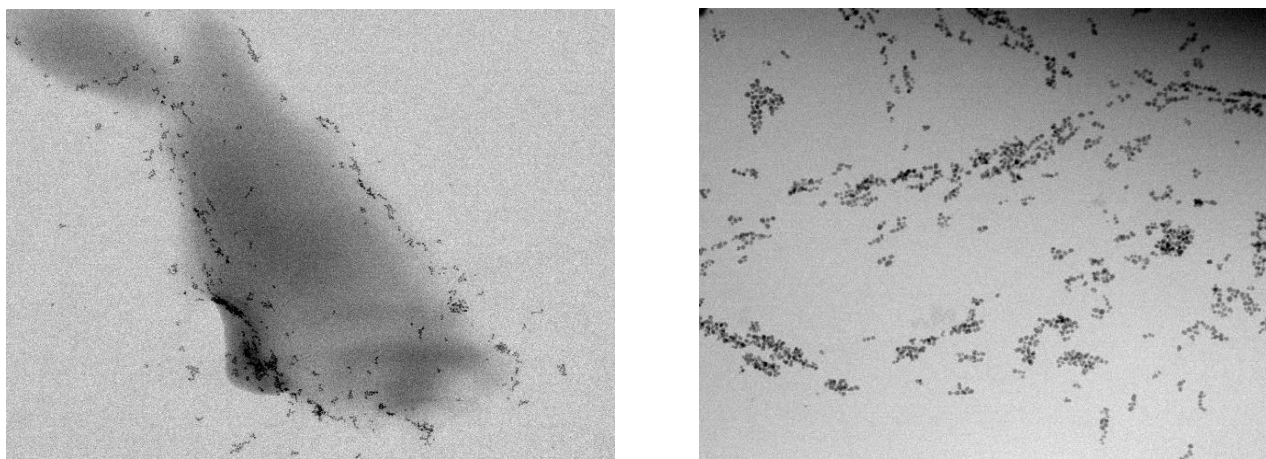


Figure 1. STEM images of oxidized nanocellulose decorated with ITO NPs

Key words: nanocellulose, nanoparticles, drug delivery, cancer

REFERENCES

- [1] N. Lin and A. Dufresne, European Polymer Journal, vol. 59, pp. 302-325, 2014.
- [2] A. Mazzotta, A. Gabbani, M. Carlotti, M. Ruggeri, E. Fantechi, A. Ottomaniello, F. Pineider, A. Pucci, and V. Mattioli, ACS Applied Materials & Interfaces, vol. 14, pp. 35276–35286, 2022.

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