

## Preparation of novel hydrophobic cellulosic composites containing Silver (I) acylpyrazolonato

*Eugenia Giorno*<sup>\*a</sup>, *Alessandra Crispini*<sup>ab</sup>, *Iolinda Aiello*<sup>ab</sup>, *Nicolas Godbert*<sup>ab</sup>, *Massimo La Deda*<sup>ab</sup>, *Fabio Marchetti*<sup>c</sup>, *Claudio Pettinari*<sup>cd</sup>, *Riccardo Berardi*<sup>e</sup>, *Pasquale Alfano*<sup>e</sup>

<sup>\*a</sup>MAT-INLAB (Laboratorio di Materiali Molecolari Inorganici, Dipartimento di Chimica e Tecnologie Chimiche, 87036 Rende (CS), Italia); <sup>b</sup>CNR NANOTEC- Istituto di Nanotecnologia U.O.S Cosenza, 87036 Rende (CS), Italia; <sup>c</sup>Scuola di Scienze e Tecnologie, Scuola di farmacia, Divisione di Chimica, Università degli Studi di Camerino, Via S. Agostino 1, 62032 Camerino (MC), Italia; <sup>d</sup>ICCOM, CNR 62032 Camerino, Italia; <sup>e</sup>TIFQLAB s.r.l Via Danimarca 87036 Rende (CS), Italia;

The surface modification of cellulose is central for a fast growing area of applications, since most vegetable-derived natural polymers are renewable materials, some of them displaying properties comparable to those of petroleum derived products.(1) The preparation of highly hydrophobic cellulose based materials is particularly important in the field of food packaging. Most materials used for food packaging applications are still produced from fossil fuels, so non-renewable and also nearly non-biodegradable, therefore representing an environmental problem.(2) In order to prepare hydrophobic cellulose, the hydroxyl groups are chemically modified, due to their reactive nature compared to the rest of the molecule. To date, fluorochemicals are usually employed for this purpose. These compounds impart not only hydrophobicity, but also oil and stain repellency.(3) However, longer fluoroalkyl chains have bio-accumulative potential in living organisms since their tendency to oxidation towards highly persistent pollutants.(4) For this reason, in this work, an alternative to the already existing processes for the preparation of hydrophobic cellulose is provided. Novel composite materials based on cellulose and Silver(I) acylpirazonato complexes have been prepared for this aim. Since Silver (I)-based compounds are highly toxic to microorganisms, as proved recently by a class of new complexes based on acylpyrazolone synthesized and tested on some antibacterial family.(5) In this work, pure and functionalized cellulose are used as substrate for the deposition of silver complexes obtained through coordination with different acylpirazonato ligands able to promote both covalent chemical bonds and/or van der Waals interactions with the substrate. These ligands are chosen in order to facilitate the interaction of the resulting complexes with the hydroxyl groups on the cellulose surface. Once the cellulose composites containing Silver(I) acylpyrazolonato are obtained, the hydrophobicity of this modified cellulose is going to be evaluated by many different methodologies, also addressed to control the stability, biodegradability and biocompatibility of the new synthesized silver-based composites.

References: 1. Reference n. 1 Yidong Zhong, Anil N. Netravali, 'Green' surface treatment for water-repellent cotton fabrics, *Surface Innovations*, 2016 . 2. Reference n.2 HMC Azeredo, MF Rosa, LHC Mattoso, Nanocellulose in bio-based food packaging applications, *Industrial Crops and Products*, 2017. 3. Reference n.3 X. Zen, J.Gong, Y. Deng, Water resistance improvement of paper by superhydrophobic modification with microsized CaCO<sub>3</sub> and fatty acid coating, *Colloids and Surfaces A: Physicochem. Eng. Aspects*, 2009. 4. Reference n. 4 S.H. Li, J.Y. Huang, M.Z. Ge, S.W. Li, T.L. Xing, G.Q. Chena, Y.Q. Liu, K.Q. Zhang, S.S. Al-Dey, Y.K. Lai, Controlled grafting superhydrophobic cellulose surface with environmentally-friendly short fluoroalkyl chains by ATRP, *Materials and Design*, 2015. 5. Reference n. 5 F. Marchetti, J. Palmucci, C. Pettinari, R. Pettinari, S. Scuri, I. Grappasonni, M. Cocchioni, M. Amati, F.Lelj, A. Crispini, Linkage Isomerism in Silver Acylpyrazolonato Complexes and Correlation with Their Antibacterial Activity, *Inorg. Chem.*, 2016.