HYDROGEL COATED PAPERS FOR ADDED VALUE PRODUCTS: THE PETRICELL DRY AND GELA USE CASES

Bruno B. Ravanello*, Monica Simões, Bruno Veigas, João Resende, Fausto Queda, Bruna Ramos, Catarina Fernandes, Rita Batista, Tomás Freire, Mariana Matias, Luis Pereira

[1] AlmaScience Colab - Madan Parque, Rua dos inventores, 2825-182 Caparica, Portugal and Quinta de S. Francisco, Rua José Estevão (EN 230-1), n.º 221, 3800-783 Eixo, Aveiro, Portugal.
*bruno.ravanello@almascience.pt, Tel (+351) 210 438 672

ABSTRACT

The use of cellulose and its derivates in various applications aligns with the push necessary for a more sustainable world. Additionally, this class of materials has been increasingly explored in highrequirement and out-of-the-box applications, demonstrating the potential of using cellulose in various added-value products.

Herein, we present two use cases that fit the innovative applications of cellulose. The Petricell Dry is a cellulose-based solution for microbial analysis replacing the traditional agar-based Petri dish. Petricell Dry is ready to use, with reduced weight and an extended shelf-life at room temperature (RT), while also bio-based, biodegradable, and recyclable. With similar performance to agar-based Petri dishes, this technology can reduce transport and energy costs, preparation time, storage space, and generated waste. Furthermore, the long shelf-life at RT allows this device to be used in emergency and disaster situationsand in countries and regions with limited access to electricity and equipment.

The other use case to be presented is the GELA technology. GELA is a cellulose-based wrap to be placed around bottles or cups. With a double-layer structure of printable paper for branding placement and a cellulose-based hydrogel for water absorption, this solution can drastically reduce beveragescooling time through a controlled evaporative cooling phenomenon while also being bio-based, biodegradable, and recyclable.

A similar process is employed to produce both technological solutions, where a base paper or fibrous layer is coated *via* different coating methods and grammages with a cellulose-based hydrogel. After coating, prototypes are cut in the desired shape and assembled. The solutions are then ready to use and were thoroughly validated regarding their properties, performance, and benchmarks in their respective uses.

Petricell Dry prototypes were submitted to sterilization and incubation processes and performedexcellently as a microbiological growth device, with results comparable to agar-based standards using different bacterial strains (gram positive and gram negative) and culture media (MacConkey and Mueller-Hinton agar).

GELA prototypes were compared uncovered glass bottles and wet tissue paper-covered bottles,demonstrating a 60 % time reduction in cooling time against the glass bottle and 30 % reductioncompared to the tissue paper-covered bottle.

In this work, we could demonstrate two use cases where cellulose and cellulose-based materials were successfully employed in advanced applications while fulfilling all the necessary requirements. A biobased microbial analysis device and a cellulose-based wrap to fast cool beverages were developed and validated, proving the feasibility of creating added-value products derived from natural resources in a sustainable and eco-friendly manner.

Keywords: CELLULOSIC MATERIALS, COOLING TECHNOLOGY, HYDROGELS, MICROBIOLY, PAPER COATING.