ECO BIO INKS 4 SMART TEXTILES

SUSTAINABLE IDENTITY THROUGH SWITCHABLE FLUORESCENCE: SMART TEXTILES WITH REVERSIBLY FLUORESCENT AND PHOTOCONTROLABLE BIO-INKS

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Colour-changing materials with controllable properties obtained by low cost and biotechnological means are highly desirable for smart innovative products and applications such as anti-counterfeiting and security printing. Protein-based nanotechnology is an ever-growing research field due to the versatility and adaptability of these biomolecule building blocks and the innovative functionalities and applications that can be achieved. [1,2] This work explores the development of a new generation of eco-sustainable inks that take advantage of the unique optical properties of selected reversibly switchable fluorescent molecules (RSFMs) for the fabrication of innovative textiles with photocontrolable and photoswitching fluorescent properties.

OBJECTIVES

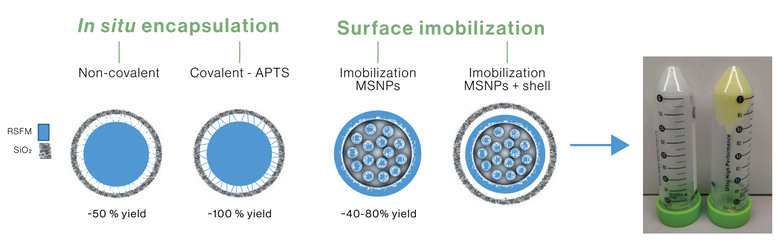
Optimization of eco-sustainable biotechnological processes for the production and purification of fluorescent biomolecules.

Nanoencapsulation of fluorescent biomolecules into biocompatible matrices to obtain inks compatible with textile processing.

Manufacture and characterization of innovative textiles through the application of fluorescent inks via conventional processes of textile functionalization.

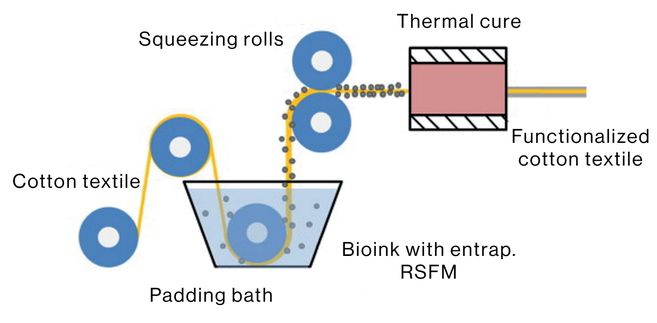
METHODOLOGY

Fluorescent bio-ink production:
Encapsulation and imobilization aproaches



RSFMs biologically fused to tags that improve their binding to silica were also used

Textile functionalization:
Padding

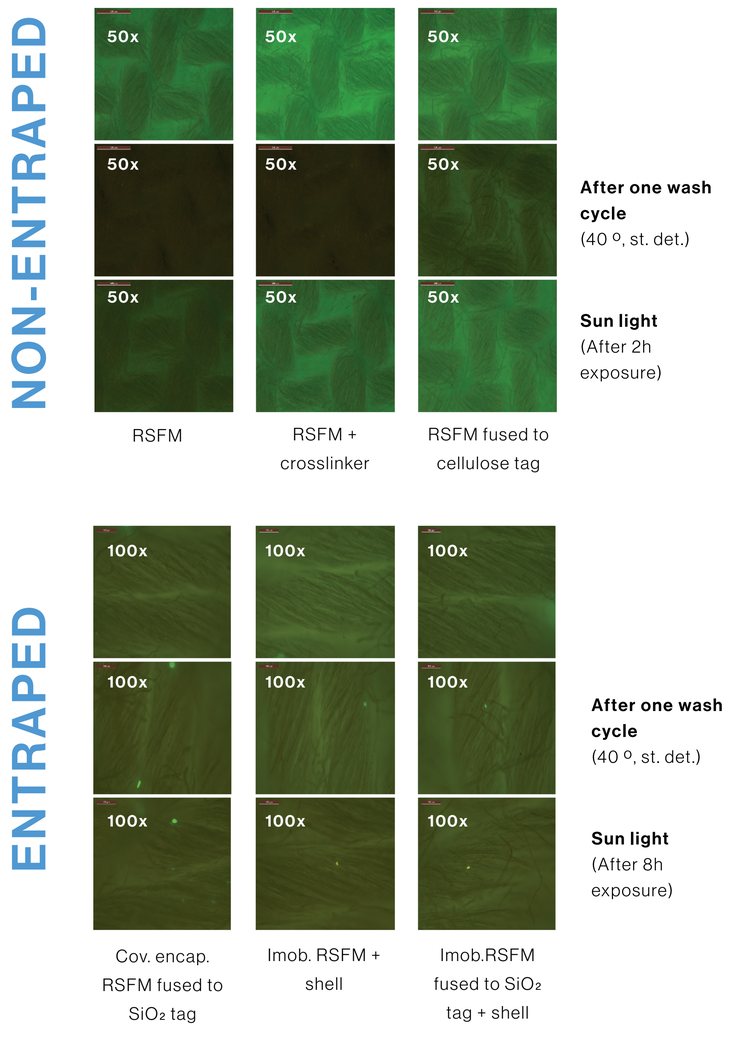


CONCLUSION

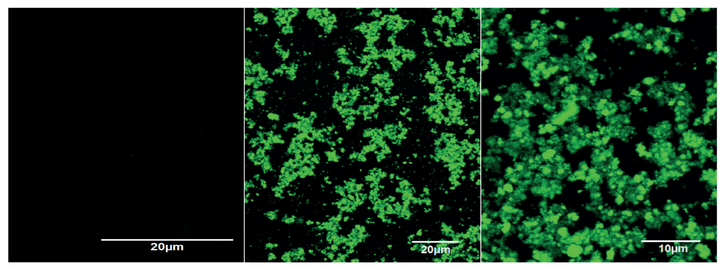
RSFMs were successfully entrapped into silica matrices, via non-covalent and covalent entrapment strategies, maintaining the original fluorescence and photoswitching properties. Covalent entrapment led, in general, to better yields than non-covalent approaches. Textile functionalization tests with non-entrapped RSFMs and RSFMs biologically fused to cellulose-binding tag showed good fluorescence, but poor fastness to washing. Textile functionalization tests with entrapped RSFMs inks showed acceptable fluorescence, but better fastness to washing.

RESULTS

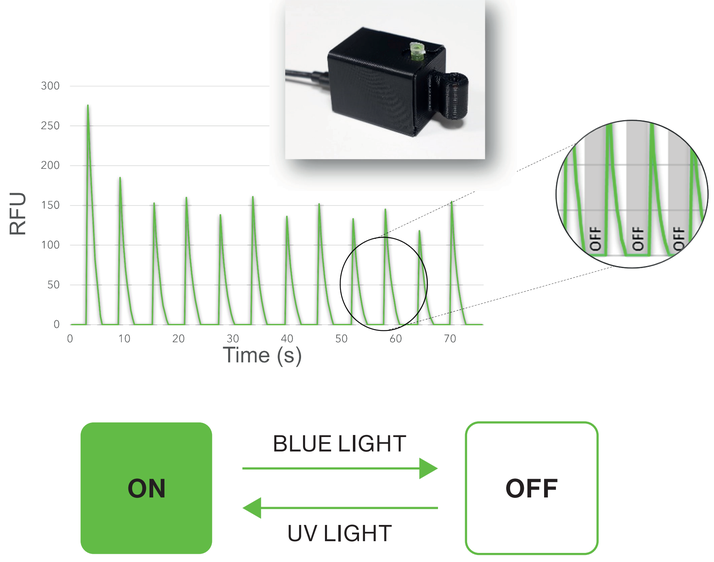
Fluorescence characterization of functionalized cotton textiles:
Optical microscopy



Fluorescence characterization of NPs:
Confocal microscopy



Characterization of photo-switch behaviour:
Developed device



Fast photocontrollable reversible switch between fluorescent and non-fluorescent states

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