

From cotton to advanced electro-tunable photonic materials

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Plants produce a large variety and amount of cellulose based-structures forming meso, micro and nano buildings with unique features and complex shapes. In this work we address the use of cellulose nanocrystals, isolated from cotton micro fibers, to produce, from liquid crystalline water cellulose nanocrystals solutions (iridescent solid film in Figure 1 a., b. and c.), responsive photonic films (Figure 1 d., e. and f.). The unique material photonic properties are acquired by the combination of the chiral solid iridescent cellulose films characteristics, with the responsiveness, to an electric field or temperature, of a nematic liquid crystal [1]. Cellulose-inspired responsive materials have a significant potential for the production of lightweight, low cost soft materials with impact on intelligent textiles, energy generation as well as in bio-medical and bio-sensing devices.

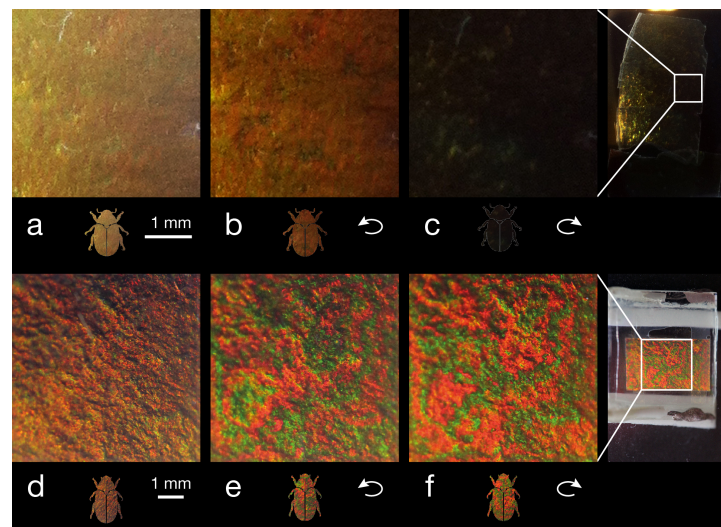


Figure 1. Photographs of cellulose nanocrystals (CNCs) iridescent solid film (a., b. and c.) and CNCs film with nematic liquid crystal (5CB) (d., e. and f.), observed with white light and circularly polarized light, showing different reflection responses similar to *Plusiotis batesi* and *Plusiotis resplendens* (silhouettes), respectively.

References

- [1] S. N. Fernandes, P. L. Almeida, N. Monge, L. E. Aguirre, D. Reis, C. L. P. de Oliveira, A. M. F. Neto, P. Pieranski, and M. H. Godinho, *Adv. Mat.*, 29, 2, 1603560, **2017**.