Liquid crystal-based microstructured materials for secure anti-counterfeiting and authentication processes

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The versatility of polymers in terms of customizable optical and mechanical properties, bio-compatibility, and cost-effective production motivated their application into several types of anti-counterfeiting tags and physical generators of secure cryptographic keys (Physical Unclonable Functions, PUFs). However, at present, these technologies are characterized by static and not updatable properties.

In this contribution, I will highlight the role of responsive materials to encode and reveal information using light. Liquid crystalline networks patterned at the microscale in an array of identical pixels with different responsiveness can encode information to the observer that can be revealed only upon application of a specific stimulus.

On the other hand, when liquid crystals are dispersed in a polymer matrix, they form a disordered ensemble of micro droplets that we demonstrate as a multilevel and multi-user generator of highly secure cryptographic password by means of light.

By combining these two concept, within the context of the PRIN project “PHOTAG”, we are developing a new-generation of inexpensive, multi-security level and easy-to-use tags for multi-step metadata optical encoding for anti-counterfeiting of goods.