



COOPERATION OFFER

GENERAL DESCRIPTION

Title Mass production of unclonable and all different fingerprints achieved through 4D Printing of multifunctional thin oxide films to provide physical and digital identities to Smart Objects and foster the 4th industrial revolution.

Summary

A French start-up has developed an etiquette-based security system, relying on patterned material properties unique fingerprint used to identify, trace or authenticate smart objects or data, both physically and digitally. Hardware cyber-security and cryptography functionalities will lead to unique interactions between different fields such as IoT, block chains or semantic web. We are now looking for industrial partners or governments adopter searching for game-changer security solutions.

Description

The company is active in additive growth of multi-functional oxide thin films (4D-printing), i.e the deposition by a unique technology of complex 3D thin film patterns in a single step (resulting in a reproducible and controlled fingerprint of physico-chemical properties based on thin film thickness, chemical composition, crystallinity, morphology, etc... leading to functional properties such as spectral reflectivity, electrical conductivity, etc). The basic principle of the security solution proposed is based on a bijective attribution of a unique material fingerprint (identity) to each Smart Object. Each of these fingerprints is a sort of QR-code with millions of dots with strong overt, covert and forensic features used to identify, trace and authenticate individually each single object. The deposition technique is adapted to mass production, and can ensure billions of different fingerprints production. It is presently foreseen that the 4th industrial revolution will be mainly driven by Smart Objects, and the problem of a secure authentication of these objects, both at physical and digital levels, is identified as the main bottleneck of this development. It is absolutely crucial, as these smart objects will both generate valuable/crucial information and take actions even in life-and-death situations (for instance for self-driving cars), that they become properly identified. Therefore, the proposed solution of a physical fingerprint linked to each object, that is not generated by a cyber security software and that involves additional cryptography features offers unique opportunities. The fingerprint of each etiquette will be read by external readers, possibly Smartphone, or could be alternatively be directly embedded in standard micro-electronic chips (CMOS sensor, CPU, memories, etc...). The proposed solution will provide incredible opportunities in fields such as IoT, block chains, Manufacturing4.0, SmartEverything (cities, grids, data, ...) among others.

Actually, we master the deposition of the fingerprint etiquettes at a mass production scale and preliminary readers are being evaluated. We are looking for industrial or governmental early adopters for technical cooperation to implement the technology in a wide range of different products. Through an industrialisation of first Proof-of-Concept devices, partners will introduce in a second step the developed industrial products to their customers.

Advantages and Innovations *(min.50 characters, max. 2000 char.)*

The developed thin film deposition technology enables all different fingerprints production, thanks to the combinatorial production methodology and the very high deposit resolution and large number of variable process parameters that induce the fingerprint features, but in a cost-effective (possibly down to a few cents per fingerprint) mass production (possibly as high as billions of etiquette/equipment/year). It further allows to achieve within a monolithically integrated device a plurality of functionalities (traceability, authentication, cyber-security and cryptography) without any need to make complex Systems-on-chip or packaging whatsoever. All proposed functionalities are top level solutions in comparison to state of the art standards. Monolithically integration guarantees top level security still keeping a high degree of flexibility to address a large gamut of possible applications. This can also further lead to a universal standard enabling cross-talk between very different verticals (such as IoT and block chains) leading to a plethora of disruptive business models. Finally, the fingerprint can enable connection of a simple object to the digital world simply through a simple etiquette sticking. This will allow to extend the IoT world to most common objects providing them with Smartness.

The fingerprint will also allow to manage several users enabling a plurality of public and private cryptography keys in parallel with functionalities that are similar to established standards (such as overt, cover, forensic, Physical Unclonable Functions or quantum cryptography features), but at very affordable costs.

Current Stage of Development*



- | | |
|--|---|
| <input checked="" type="checkbox"/> Under development /laboratory tested | <input type="checkbox"/> Field tested / evaluated |
| <input checked="" type="checkbox"/> Available for demonstration | <input checked="" type="checkbox"/> Prototype available for demonstration |
| <input type="checkbox"/> Already on the market | <input type="checkbox"/> Concept stage |

Comments Regarding Stage of Development:

The platform provides very different technologies with variable TRL (roughly between TRL3 and 7). Thin film deposition technique to deposit multi-functional material patterns behaving as unique fingerprints is mastered. Several patterning options operating at different scales (from few hundreds of nanometres to millimetres scales) and different material property modulation inducing several different functional properties (optical, electric) are also mastered. The etiquettes customization for a given application should be defined individually for each application in collaboration with our partners, depending on the amount of overt, covert and forensic information that should be incorporated, and depending on the type of readers that are foreseen.

Intellectual Property Rights Status*:

- | | |
|---|--|
| <input checked="" type="checkbox"/> Patent(s) applied for but not yet granted | <input checked="" type="checkbox"/> Secret know-how |
| <input checked="" type="checkbox"/> Granted patents | <input checked="" type="checkbox"/> Exclusive rights |
| <input type="checkbox"/> Copyright | <input type="checkbox"/> Trade Marks |
| <input type="checkbox"/> Design rights | <input type="checkbox"/> Others (registered design, plant variety, etc.) |

Comments Regarding IPR Status: (e.g. countries for which protection has been granted or applied for)

Several patents cover the equipments, the thin film deposition processes and the device itself. We have a coverage of US, Europe, China and India.
 Patent references:
 G. Benvenuti, E. Wagner, C. Sandu. Deposition Process Based on Stencil Mask and Application to the Fabrication of Tags Supporting Multi-Functional Traceable Codes. Patent:WO2015/140731A1, Sept. 2015. Applicant: 3D-Oxides S.A.S (F).
 G. Benvenuti, E. Halary-Wagner, and C. Petit. Vapor phase deposition system. Patent EP2347030 A1, Dec 2009. Applicant: ABCD Technology S.A. (CH).
 G. Benvenuti, E. Halary-Wagner, S. Amorosi, and P. Hoffmann. Large area deposition in high vacuum with high thickness uniformity. Patent EP1504136, Nov 2003. Applicant: Ecole Polytechnique Fédérale de Lausanne (CH).

Preferred Countries for Dissemination:

Countries covered by the patents, but principally Europe and US.

DETAILS OF YOUR OWN ORGANISATION/COMPANY

Type* Industry R&D Institution University Private Inventor

Other: please specify

Comments:

Organisation/Company Size* (please tick one box) < 10 employees 11-50 employees
 51-250 employees 251-500 employees > 500 employees

Year Established: 2008

Turnover (only for business profiles): < 1 mio 1 – 10 mio
 10 – 20 mio 20 – 50 mio 50 - 100 mio

Already Engaged in Trans-National Cooperation Yes No

Experience Comments: Already involved in several EU projects (since FP6) and national R&D programs. Some already ongoing discussions with some industrial partners for specific fields.

Certification Standards:

Languages Spoken: French, English, Italian

COLLABORATION DETAILS

All kind of collaboration are possible and this will depend on the business model preferred by the partner. The model guarantees the possibility to address a wide range of different fields and exclusivities can be negotiated separately for each vertical.

Type of partnership considered:

Technology Offers

- Commercial Agreement with technical assistance (an agreement arranging the acquisition of a product/technology paired with the provision of a number of services in support of a transfer of technology)
- Joint Venture Agreement
- License Agreement
- Technical co-operation agreement
- Research co-operation agreement

Business Offers

- Distribution services agreement
- Acquisition agreement
- Franchise agency agreement
- Manufacturing agreement
- Outsourcing agreement
- Subcontracting
- Financial agreement
- Services Agreement

Type and Role of Partner Sought*:

- Type of partner sought (*such as industry, academy, research organisation*):
Industrial or governmental partner.
- Specific area of activity of the partner (*example: manufacturer/distributor/user/disposal of plastic packages etc.*)
- Main tasks of the partner will be to define product specifications and functionalities for market customisation and introduce it on the market.
- Tasks to be performed by the partner sought: What expertise/ tasks do you expect from the partner?
- Active in security markets. capacity to distribute/adopt the products on large scale.

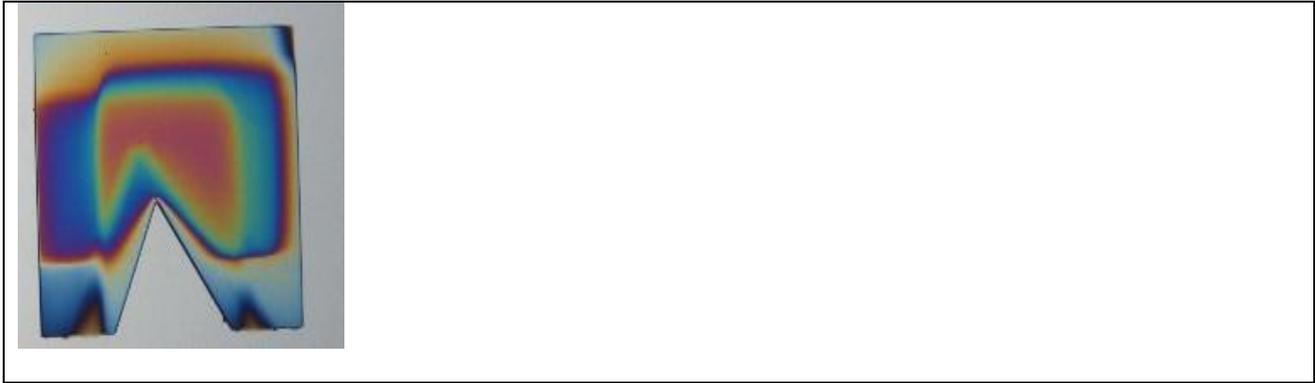
Size and Type of Partner Sought (e.g. industry, research):

Large player in Industry or governmental sector.

Additional information (pictures)

Example of a 1 x 1 mm² simple fingerprint deposited with a single oxide material and aimed at being read with a simple Smartphone, measuring a matrix point of spectral reflectivity:





CONTACT

Please contact the RespiceSME coordinator Samantha Michaux for the contact data of the company.

Samantha Michaux
Steinbeis 2i GmbH

michaux@steinbeis-europa.de