The Hardecoat project aims at developing new functional coatings for decorative and micro-optoelectronics applications. The coatings based on transition metal oxynitrides are deposited by Physical Vapour Deposition (PVD) techniques, especially by reactive sputtering. The idea is to combine the excellent mechanical properties of the nitrides with specific optical characteristics of the oxides. By tuning the deposition conditions, coatings with composition varying from oxides to nitrides are reached, exploring the unknown and vast spectrum of oxynitride thin film compounds.

Project deliverables

- A clean and environment-friendly process (no waste disposal, no hazardous gas emission, no water, soil and air pollution)
- An extremely versatile process allowing significant variation of the coating properties
- To develop safe and cheap coatings (reduction of materials content, materials price and increased lifetime of the products)

The coatings will be deposited by Physical Vapour Deposition techniques mainly by reactive sputtering. Since conventional reactive sputtering with a simultaneous injection of two gases (oxygen and nitrogen) is not a suitable process to deposit metal oxynitride coatings, an original deposition technique will be developed. Based on the already acquired pre-existing know-how on Reactive Gas Pulsing Process (RGPP), this process will be further developed and implemented for the deposition of TM-O-N coatings with adjustable and flexible chemical compositions.

POTENTIAL IMPACT

Surface treatment and coating industry (annual market of 25 billion € and 200 000 employees in Europe) play a key role in various industrial branches (biomedical, food, microelectronics, automotive, aerospace).

The project significantly contributes to the sustainable development and the following EC priorities:

- Contributing to modernisation of industry and adaptation to the new economy through improved industrial capability and innovation capacity.
- Substantially improving overall quality within the value chain.
- Minimising wastes, use of hazardous substances and resource consumption.

The main industrial impact of the project is expected to be in the decorative surface treatment sector. Yet, the versatile applicability of the oxynitride coatings will open markets in the area of biomedical products (implants, surgical tools), optical components (filters, solar absorbers, electrochromic windows) or microelectronics.
Development of new hard decorative coatings based on transition metal oxynitrides

HARDECOAT
http://hardecoat.ens2m.fr

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The Project Team

The HARDECOAT consortium is composed of 13 partners coming from 5 European countries. There is a core of 6 research institutes, 6 industrial partners and 1 consulting company.

Ecole Nationale Supérieure de Mécanique et des Microtechniques - ENSMM
Besançon, France
www.ens2m.fr
Coordination of the project, Reactive Gas Pulsing Process development, structural and electrical characterisation.

Haute Ecole ARC - Department of Microtechnics and Optoelectronics - HE ARC
Le Locle, Switzerland
www.eiaj.ch
In-depth chemical composition analysis, optical properties, mechanical and tribological characterisation.

Forschungsinstitut für Edelmetalle und Metallchmie - FEM
Schwäbisch Gmünd, Germany
www.fem-online.de
Pulsed Power Magnetron Sputtering, microstructural characterisation, degradation and corrosion resistance analysis.

Université de Franche-Comté - UFC
Montbéliard, France
www.univ-fcomte.fr
Structural analysis, colour measurements.

Faculdade de Ciencias e Tecnologia da Universidade de Coimbra - FCTUC
Coimbra, Portugal
www.fct.uc.pt
Microstructural characterisation, mechanical and tribological characterisation, thermal treatments.

Universidade de Minho - UM
Braga, Portugal
www.fisica.uminho.pt
Reactive Sputtering with Gases Mixture, mechanical and tribological characterisation, thermal treatments, structural analysis.

PVDco SARL - PVDCO
Nancy, France
Process and coatings testing (end user).

NBS Technologies SAS - NBS
Rousset, France
www.nbtech.com
Coatings testing in microelectronics.

Alliance Concept SARL - AC
Cran Gevrier, France
www.alliance-concept.com
Process and coatings testing (end user).

Teer Coatings Ltd - TCL
Droitwich, UK
www.teercoatings.co.uk
Coatings testing.

Jado Iberia Produtos Metalurgicos SA - JDI
Braga, Portugal
www.jado.pt
Coatings for decorative applications.

Montblanc Montre SA - MB
Le Locle, Switzerland
www.montblanc.com
Coatings for watch making industry applications.

ALMA Consulting Group - ALMA
Lyon, France
www.almacg.com
www.prodigex.com
Administrative and financial management.