M2DESCO

MaterialsWeek 2024
17. - 21. June 2024
Crown Plaza Hotel, Limassol, Cyprus

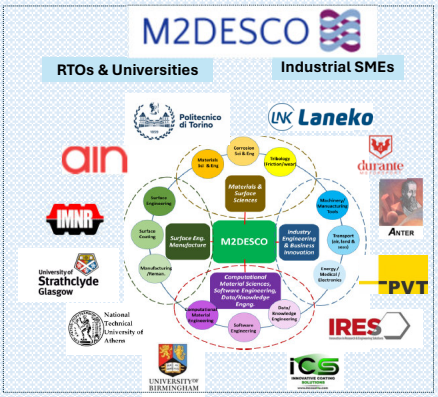
Computational Multi-Models Enabled Design of Safe and Sustainable Multi-Component High-Entropy Coatings

THE MAIN OUTCOMES, ..., OUR DREAM

Promote powerful and reliable computational software tools to **help EU coating (PVD in particular) industry to evolve from trial-and-error approaches to digitally integrated and AI-enabled faster and more efficient coating development cycles**, from composition selection to the process parameterization and validation – **reducing the development time-lines by 400~500%** is expected.

Unprecedented hardness/toughness improvements, in combination with thermal and chemical stability (e.g. 100% increase of wear resistance, and 50~60% increase of corrosion/oxidation resistance), can, among other impacts, promote **replacement of Cr-VI** in still challenging applications in many industry sectors.

Further enhance the implementation of **Advanced SSbD Methodology and Enabling Tools** that address all the industrial implementation and enable minimal uses of critical substances during these processes (**reducing the criticality of coating materials by at least 70%**)



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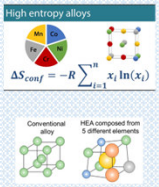
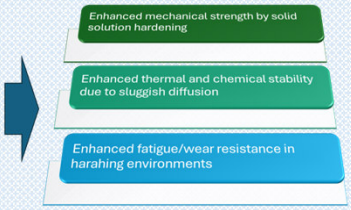
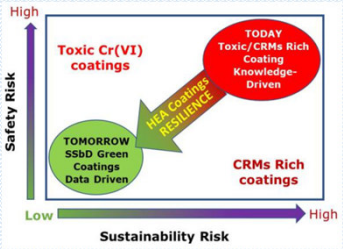
What are & why HEA & HEA Coatings



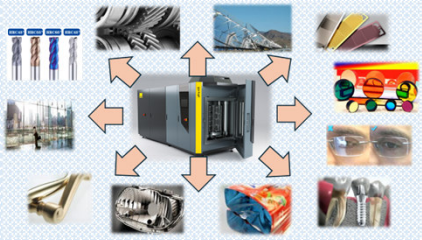


A multi-element alloy formed by 4 or more constituents, yielding a (non-equilibrium) solid solution. It can be equimolar to maximize the mixing term of the conf. Entropy.

The value of the physical vapour deposition: a high tech business EU is leading

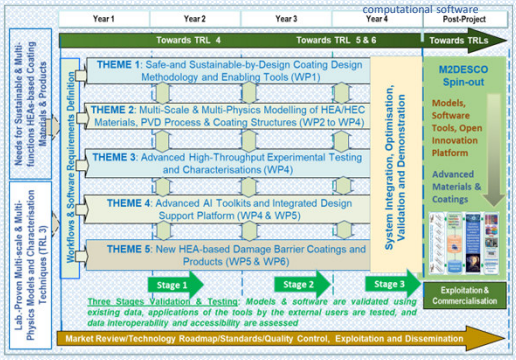


M2DESCO aim at a Glance

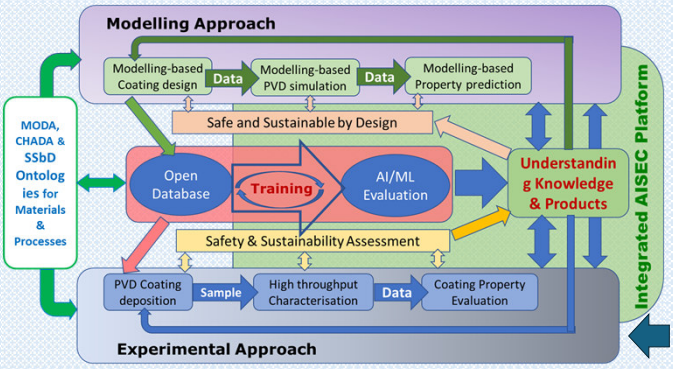


Physical Vapour Deposition is a Technology to manufacture/produce thin films of tailored compositions and properties. It encounters numerous applications.

How M2DESCO performs

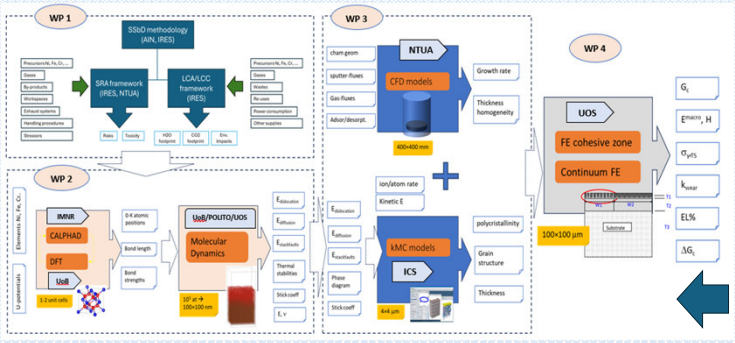


M2DESCO technical pipeline, including scientific research themes as well as the stages for validations and the envisaged exploitation targets.



Methodology integrating SSbD, Modelling, Experiments and AI/ML tools into the design of new coating-materials and production process evolution.

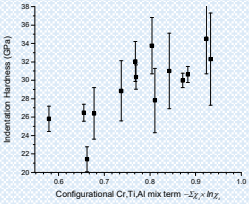
Advanced Multi-Scale interliked models

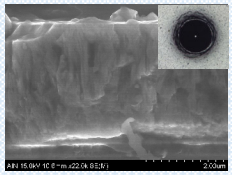


Scheme of the interconnected multiscale models for HE coatings. Observe outputs from microscopic modes feed as inputs for the larger scaled models. SSbD outputs are fed in the AISEC platform to provide warnings & recommendations over materials impacts.

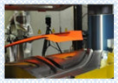
High throughput processing & characterization

PVD multitarget approach
Rapid chemical composition depth distribution measurement
Dynamic Mechanical Compliance Testing (DMCT)





GG. Fuentes et al Surface & Coatings Technology 420 (2021) 127326

Sector	Materials, Coating & Design Companies	Manufacturing with Machining	Manufacturing with Forging/Forming
End-user	**AIN, PVT, ICS**	**D4S & PVT**	**LNK & PVT**
Demonstrators (Significant market sizes are indicated in section 2 IMPACTS	New Coating Design System - AISEC	New Cutting Tools for Dry High-Speed Machining	New Dies and Moulds for Hot Forging
			

Industrial use and bussines cases

Contribute to safety, sustainability, growth/jobs, circularity and resilience by eliminating the uses of rare earth elements (REEs) and PGM group metals, and reduce the uses of critical metal elements

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