

Incubation Forum for Circular Economy in European Defence (IF CEED)

Project idea

Substitution of Critical Raw Materials in Coatings



Context

Hard chrome solutions for coatings are based on a Critical Raw Material (CRM) and, due to their toxicity, fall under the scope of REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals). The availability of substitutes with adequate performance would therefore bring several benefits.

Chromium is identified as a Critical Raw Material; the replacement by solutions based on other materials would therefore limit the supply risk in the value chain.

The Hard Chrome (HC) coatings have been substituted in most civil applications using different materials to avoid REACH restrictions (linked to Cr(VI) chemicals). Nevertheless, in military applications, especially aeronautic and aerospace, HC is still used under a specific exemption: it is estimated that more than 20,000

different equipment parts and 1 million elementary part numbers per aircraft are interested.

To answer health, safety and environmental concerns but also strategic aspects in the supply chain, it is needed to find a suitable alternative, i.e. a technical solution that meets defence requirements in almost all the environments.

Objectives

The project aims at providing with sustainable CRM-free solutions for corrosion and wear protection, in substitution of Hard Chrome/chromates coatings.

The specific objectives are to:

- Define main critical aspects related to CRMs in surface treatments.
- Perform a risk assessment of identified surface treatments related to CRMs/REACH.
- Study and develop disruptive processes by means of thin films technologies, applied with innovative methodologies as well as the application of non-CRM materials (such as PVD, sol-gel, electroplating and also hybrid solutions).
- To establish a fast and robust testing methodology for selecting the most promising coating alternatives.

Methodology

The activities could be divided into WPs as follows:

WP1. Analysis of current situation in terms of industrial solutions available for CRM substitution mainly focused on HC/chromates.

WP2. Development and/or implementation of short-term solution (mitigation action).

WP3. Development and implementation of innovative coating solutions CRM-free.

WP4. Implementation of testing methodology for evaluation of reliability of CRM-free coatings.

Stakeholders

- Entities engaged in the IF CEED Project Circle “Critical Raw Materials”.
- Research-and-Technology Organisations.

Timeline & Milestones

The foreseen duration of the project is 36 months.

Expected Outcome

Development of a coating solution with a wide range of applicability with a final TRL 5/6, based on:

- A risk mitigation roadmap toward the short- and long-term impact of CRMs and REACH-regulated substances on surface treatments for military application.
- Evaluation of new coating solutions without CRMs for chromates and HC replacement.

Operational benefits

- Enhancing security of supply.
- Improving the Health & Safety conditions through reduction of toxicity.

Budget & funding

Type of project: collaborative project.

Budget: EUR 1 500 000.