MOZART

METAL MATRIX NANO-COMPOSITE COATINGS UTILIZATION AS ALTERNATIVE TO HARD CHROMIUM

4th ISSUE
November 2023

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Funded by the European Union

Funded by the European Union under GA number 101058450. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

1. Wolfgang Amadeus Mozart: Our inspiration

Wolfgang Amadeus Mozart, a visionary composer of the classical period, had a profound influence throughout his life, creating innovative musical works that transcended conventional boundaries. Mozart was born in Austria in 1756 and was famous from a very early age- being known as a child prodigy. Mozart experienced his major breakthrough as a composer with the opera "Idomeneo", which premiered in Munich in 1781. What set Mozart apart as a musician was his versatility. He could write extremely complex pieces and captivate his audience with very memorable melodies.

His extraordinary talent not only reshaped the landscape of classical music but also inspired future generations of composers. Mozart's enduring legacy continues to serve as a foundation of classical music, reflecting his unprecedented creativity and profound impact on developments in musical expression.

This great musician and composer who revolutionized and impacted the classical music landscape of Europe and the world is our big inspiration

In our project we are aiming to follow his example and transform the surface finishing industry of Europe by eliminating the use of Hard Chromium coatings. The process of acquiring these types of coatings presents significant environmental and occupational health issues as it is based on the use of Chromium Trioxide (CrO3) also known as hexavalent chromium (Cr6+), a recognized toxic, carcinogenic, and mutagenic compound.

However, our project is here to offer an environmentally less harmful and less toxic alternative to the painting and coating industry. It proposes Safe and Sustainable by Design (SSbD) coating solutions in specific applications based on Nickel (Ni) matrix nano-composite electroplating processes. Nano-composite coatings containing nanoparticles (NPs) and nano-enabled materials as reinforcing means are potential candidates as durable protective coatings in applications where high wear and corrosion resistance are needed.

1. Wolfgang Amadeus Mozart: Our inspiration

The innovation in MOZART lies in two families of Ni composite coatings that will be developed and tested in 3 test cases: in the manufacturing, machinery and automotive industry. Complementarily, the development of a web-based Decision Support Tool (DST) and the implementation of Artificial Intelligence (AI) models and simulation are supporting the integration of SSbD approaches and the advancement of new technologies into the industry. Our DST enables end users to exploit MOZART's safe and sustainable technologies, ensuring alignment of their products, materials and processes with the "sustainable by design" concept.

Mozart's music spread far and wide during his lifetime, captivating audiences and reshaping classical compositions. Similarly, the MOZART project is on a mission to spread the word about its innovations across industries and markets targeting to maximize our impact.

Here's how we plan to do it:

1. **Identify and promote our most promising results:**
   Just as Mozart's compositions were celebrated for their creativity; the MOZART project will develop and leverage its innovative results to create a profound impact on the market. But we don´t stop there: By developing corporate business plans, it will ensure that its groundbreaking solutions find their way into practical applications.

2. **Intellectual Property Rights (IPR) Strategy:**
   Just as Mozart's creative work needed protection to become a point of reference in the classical music world, the MOZART project is developing a robust IPR strategy to safeguard its innovations. This ensures that its transformative technologies are protected and can be utilized in a way that benefits the industry and society at large.

3. **Best-Practice Guidelines:**
   Like Mozart's music became a catalyst for many generations of composers and musicians afterwards, the MOZART project is developing best-practice guidelines for the surface finishing industry in line with the principles of SSbD. These guidelines shall serve as a reference for the industry, encouraging the widespread adoption of sustainable and innovative practices.

We chose big footsteps to follow but we are determined to succeed. The surface finishing industry is about to change towards a more sustainable, greener and healthier direction and we are proud to be part of it!

2. MOZART´s Industrial Applications

In the MOZART Project, our aim is not only to develop advanced coatings but also to test their effectiveness in real-world industrial applications. We are excited to share with you the demonstration activities that will be conducted to evaluate the novel coatings in relevant environments.

MACHINING

Kampakas Group will be responsible for conducting demonstrations with coated helical gears. These gears are widely used in various types of motors. The application of MOZART coatings aims to address aspects such as corrosion prevention, wear resistance, surface smoothing, and friction reduction. Our goal is to identify the most suitable Ni/2D NPs composite coating based on the reinforcing mean, including materials like Graphene (Gr), Tungsten Disulfide (WS2), and Molybdenum Disulfide (MoS2).

MANUFACTURING

Coşkunöz will be leading the demonstration activities in the manufacturing sector. The coatings will be applied to stamping dies, which are precision tools used to cut and shape sheet metal into desired profiles. In addition to replacing the traditional hard chromium (HC) process, our focus is to increase the lifespan of the dies and explore the repairability of the MOZART coatings.

AUTOMOTIVE

DIAD will play a crucial role in the demonstration activities for the automotive industry. The novel coatings will be applied to piston rods, an integral component that connects the piston to the crosshead and, subsequently, to the connecting rod that drives the crankshaft in car engines. The coatings commercially available for piston rods face challenges related to hardness, wear, and corrosion resistance. In the MOZART Project, we aim to apply and test more durable coatings to overcome these concerns.

These demonstration activities will enable us to evaluate the performance and suitability of the MOZART coatings in specific industrial applications. By addressing issues such as corrosion, wear, and increased lifespan, we aim to provide solutions that surpass traditional coating methods.

Stay tuned for updates on our industrial application demonstrations as we continue to work towards revolutionising the industry and contributing to a more sustainable future.

3. Green Chemistry and MOZART

Green chemistry is a scientific discipline dedicated to the design and development of chemical processes and products that minimise environmental impact while maximising efficiency, safety, and sustainability. It is fully consistent with MOZART's goal of eliminating the use of toxic and carcinogenic hard chromium (HC) coatings in various industrial applications.

Why Green Chemistry is important

Green chemistry is an innovation that focuses on the principles of sustainability, safety and environmental responsibility. It aims to:

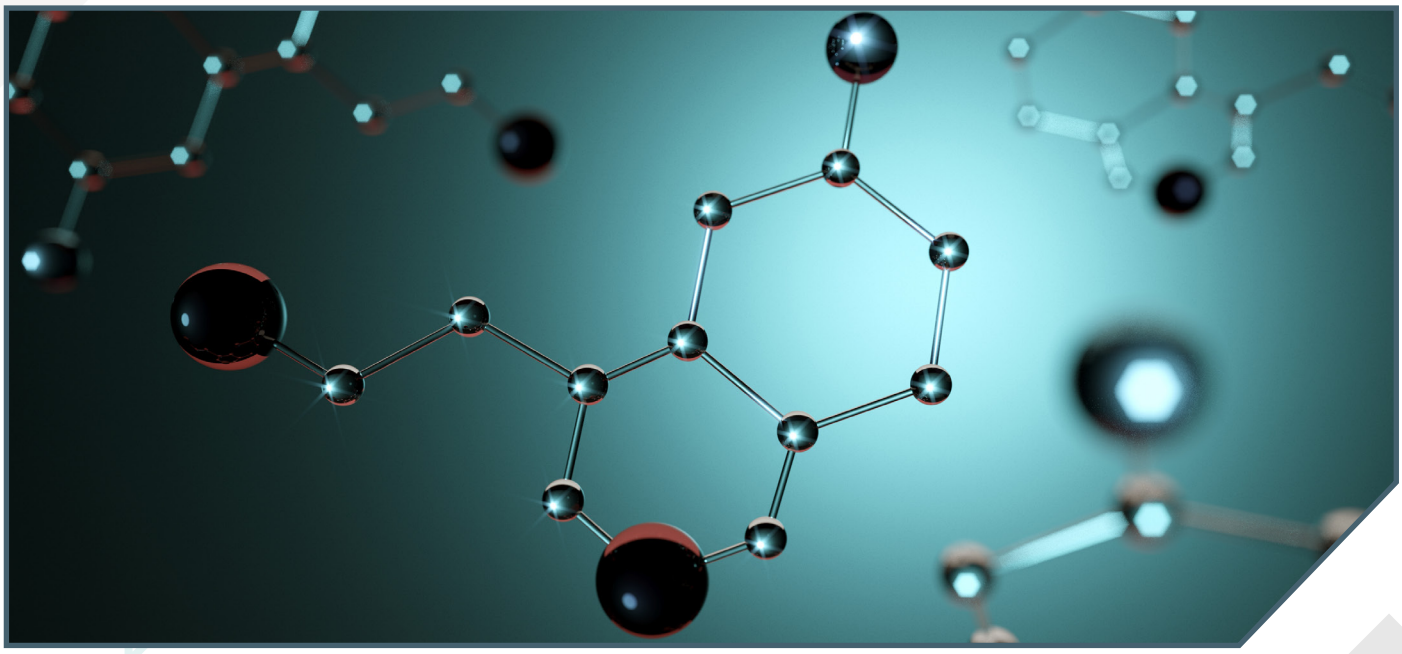
a. Reduce toxic substances:

By eliminating or minimising the use of toxic chemicals, Green Chemistry promotes safer working conditions and protects human health and the environment.

b. Increase quality:

Green chemistry aims to optimise chemical processes to reduce waste, conserve resources and save energy, thereby making industries more sustainable and profitable. Creating sustainable alternatives:

One of the main goals of Green Chemistry is to develop environmentally friendly alternatives to toxic chemicals and processes. MOZART exemplifies this goal by replacing hard chromium (HC) coatings with advanced Ni-based nanocoatings that are not only safer, but also more durable and mechanically superior.



3. Green Chemistry and MOZART

Connection of MOZART with Green Chemistry

The MOZART project is a prime example of how green chemistry principles can be applied to create a safer and more sustainable future.

Here's how MOZART fits into the ideals of green chemistry:

Reduce toxicity:

MOZART aims to eliminate the use of toxic hard chromium coatings, providing a less environmentally harmful alternative to the paint and coatings industry, in line with Green Chemistry's goal of reducing the use of Hazard.

Improved durability:

By developing a composite coating based on a nickel (Ni) matrix nanocomposite electroplating process, MOZART contributes to more sustainable industrial operations.

Process Optimisation:

The project uses AI and computational hydrodynamic models to optimize the nanocomposite plating process, an excellent example of using advanced technology to improve efficiency and reduce waste, a basic version of green chemistry.

Surveillance and security:

MOZART integrates an online monitoring system to ensure the safety of nanoparticles in the electrolyte, reflecting a commitment to safety and responsible chemical management as advocated by Green Chemistry.

Recycling and circular economy:

The project not only focuses on the development of alternative coatings but also makes recommendations on the recycling of "end of life" coated metal objects, in accordance with the principles of chemically driven circular economy green set.

In summary, Green Chemistry and the MOZART project share the same vision:

Making industrial processes safer, more sustainable, and more environmentally friendly.
By eliminating harmful substances and applying innovative solutions, MOZART is paving the way for a future where industrial and environmental management go hand in hand.

4. News and Events

12M Meeting at AIMEN & IPR Workshop

A year has swiftly passed since the beginning of our ambitious project, and we're thrilled to share the highlights from our recent **consortium meeting** held at the **AIMEN Centro Tecnológico** facilities in O Porriño, Spain. During this gathering, our partners engaged in lively discussions, unveiling remarkable progress achieved in the project's first year. Consortium members showcased innovative research, breakthrough technologies, and promising results, all contributing to our mission of revolutionising the surface finishing industry.

AIMEN Centro Tecnológico provided the perfect setting for collaboration, knowledge exchange, and strategic planning, fuelling our enthusiasm and commitment to positive industry change.

We also took this opportunity in order to host our **IPR Workshop** which was held by **AXIA Innovation** providing valuable insights and guidance in regards to IPR, empowering the consortium members to enhance their understanding of intellectual property rights and their application in the context of MOZART's groundbreaking advancements.

4. News and Events

Clustering Event:

Skills Guiding the Green Transition of the Plating Industry

MOZART and its cluster projects **FreeMe**, **NICKEFFECT**, and **NOUVEAU** project jointly participated in an event entitled **"Skills Guiding the Green Transition of the Plating Industry"** which was organised in the framework of the EU Green Week!

In this event the project coordinators introduced the research objectives and impact of each project highlighting our valuable contributions to the transition of the plating industry to a more green, sustainable and resilient sector.

NANOSMAT 2023

Cnano represented MOZART

Our partners from **Creative Nano** participated on behalf of MOART in the **NANOSMAT 2023** conference in Athens, Greece, which is focusing on nanomaterials and nanotechnologies. Cnano presented a poster titled "REACH compliant coatings as alternative for hard chromium," showcasing their research on substituting boric acid in nanocomposite electrolytes. The results were promising, highlighting the development of alternative nanocomposite coatings with excellent properties. Stakeholders and industrial partners expressed interest in the project, indicating successful dissemination.

4. News and Events

MOZART
featured at the Galvanotecnica e Nuove Finiture

The latest issue of "Galvanotecnica e Nuove Finiture" (Issue No. 3-2023) featured an extensive 8-page section dedicated to MOZART. They highlighted and explained our goal is to eliminate the use of toxic and carcinogenic Hard Chromium (HC) by using environmentally friendly Nickel (Ni) matrix nanocomposite electroplating processes.

These coatings are designed to be durable and long-lasting, aligning with the principles of Safe and Sustainable by Design (SSbD) for a safer and more sustainable solution.

Read and Download
the paper
by clicking **here.**

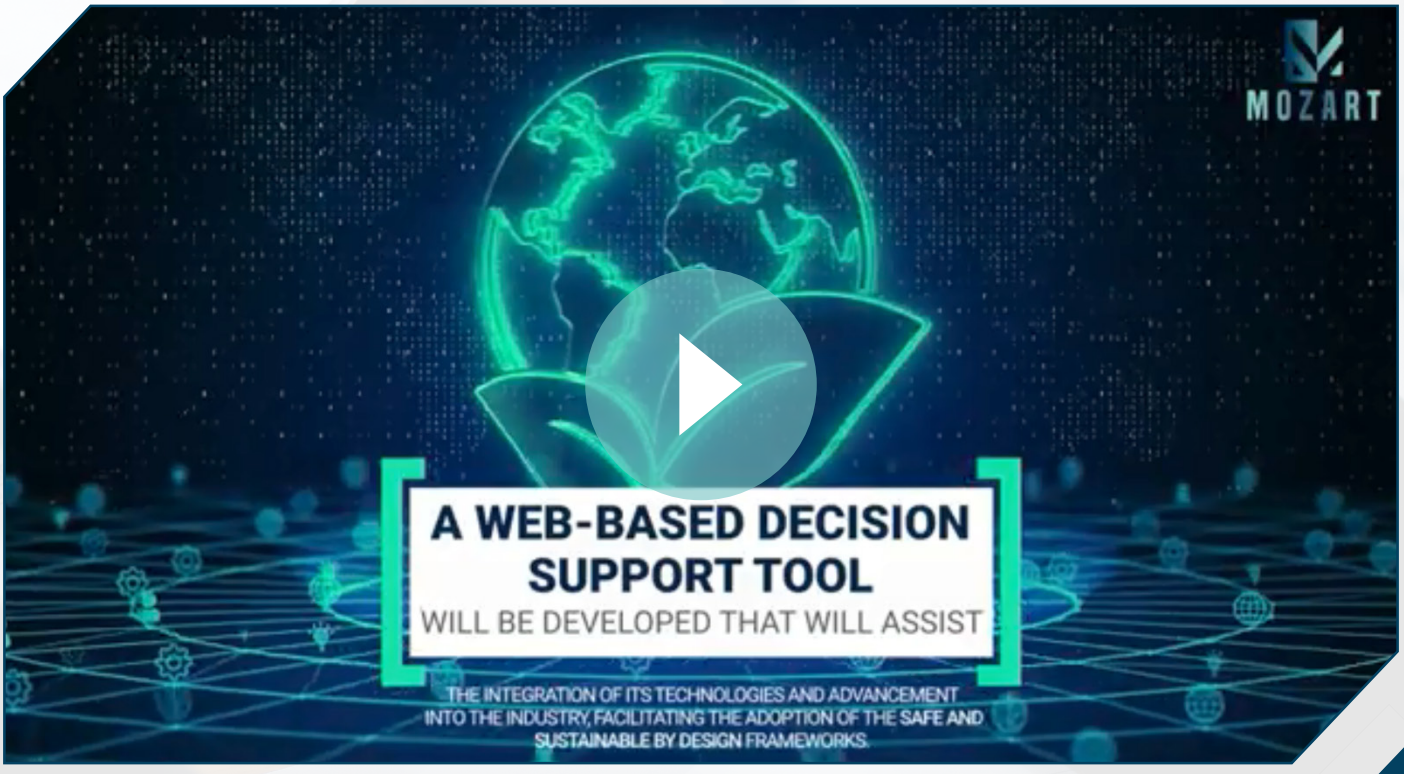
5. MOZART´s Official Video

We are happy to announce that the first video of the MOZART project is available on YouTube! Prepare for an exciting visual journey as we explore the world of advanced nano-coatings and their potential to transform surface engineering.

Our video provides insights into why MOZART is determined to push the boundaries of conventional coatings. See how our project fits into the landscape of sustainable practices and the urgent need for safer alternatives to contaminants like hard chrome.
The video embodies the main purpose of the MOZART project. We are passionate about developing nano-coatings that surpass traditional methods by improving performance and reducing environmental impact. Through extensive research, experimentation and collaboration, we pave the way for a more sustainable future. But that's not all! The video also highlights the significant impact these new nanocoatings can have on various industries and society at large. The MOZART project aims to contribute to a cleaner, safer and more sustainable world by reducing pollution, improving durability and minimising health risks.

Join us on this inspiring adventure into a future where coatings exceed expectations and create a brighter world. Stay tuned for more updates and exciting developments as the MOZART project continues to make impressive progress in the field of nanocoatings.

From hard chromium to sustainable coatings: The MOZART Project unveiled - YouTube



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Follow the project on social media

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