M-era.Net

Final Report

Project acronym: *MIST*
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M-ERA.NET Call 2020

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Coordinator: Prof. Stephane Lucas | stephane.lucas@unamur.be |
University of Namur (UNamur), Rue de Bruxelles, 61, B-5000 Namur,
Belgium

2. Publishable project summary

Thin film materials are key components in a large variety of fields including automotive and mechanical engineering, optics, micro- and nanotechnology, medical applications, photovoltaics and display technology.

Stoichiometric SiO_2 is one of the most used coatings deposited by Physical Vapor Deposition (PVD) for various applications. Although magnetron sputtering PVD process is widely used to deposit nanometric layers of various compounds, in the case of SiO_2, it is only suitable for thin layers for industrial applications. An alternative to the magnetron sputtering process for production of thick (and thin) SiO_2 coating is the Plasma-Enhanced Chemical Vapor Deposition (PECVD) process, like for example a process based on hollow cathode source (HC). Deposition can take place at high rate for many days of continuous operation from a mixture of O_2/ TMDSO. Unfortunately, coating composition will vary strongly with the process parameters, and their impact on film quality and uniformity is not well understood today.

The aim of the MIST project is to build a digital twin of a PECVD process, from the plasma to the coating properties. The innovative approach of this project is to replace a major part of the trial-and-error with advanced numerical models of the underlying physics and chemistry.

The simulation framework developed within this proposal will be a general toolbox having numerous possible applications of PECVD like for applications in solar, window film, glass, textile, and packaging industries, where reproducible large-scale thick SiO_2 deposition is needed. But, for this proposal, it will be dedicated to a process based on a hollow cathode principle and validated by experimental data obtained by AGC and its subsidiaries (world leader in glass production), industrial partner on either lab scale or industrial size coater.