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Book of Abstracts

Società Chimica Italiana

Ca' Foscari University of Venice

EuChemS
European Chemical Society

Dear colleagues,

On behalf of the Executive Board of the European Chemical Society, I wish you a warm welcome to this 18th International Conference on Chemistry and the Environment. The European Chemical Society – in short EuChemS – is an overarching society at the European level with over 50 national member societies as members. In this way, EuChemS represents approximately 130,000 chemists from all over Europe. Did you ever realize that by being a member of your national society, you are a member of EuChemS too?

The slogan of this conference is 'Towards a pollution free society', which is well aligned with activities from EuChemS. The European Commission recently set up the Zero Pollution Stakeholder Platform and EuChemS was invited to join. The platform will effectively mainstream the zero pollution agenda by bringing together stakeholders and experts of different policy areas, including health, agriculture, research and innovation, transport, digitalization and the environment. EuChemS will emphasize to address the Zero Pollution challenges from the chemistry perspective in a science-based approach.

I am here in the Netherlands, but you are in the beautiful city of Venice, that I am sure will inspire you to have fruitful and constructive discussions on how to get to zero pollution and how to address many other challenges to create a sustainable environment. I wish you a very enjoyable conference!

Floris Rutjes

President of the European Chemical Society (EuChemS)

The Stability of Tio₂-rGO Self-Cleaning Photocatalytic Coatings for Outdoor Applications

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Self-cleaning coatings are lately being studied for different applications such as civil buildings (windows, facades, indoor walls, metallic products), the automotive industry (mirrors, windshields, the health field (surgical rooms' walls or tiles) and renewable energies, namely for solar energy (solar reflectors, photovoltaic panel). The self-cleaning occurs through two mechanisms that involve (1) (super)hydrophobic coatings, when the pollutant rolls off the surface without being degraded or (2) (super)hydrophilic coatings, when the pollutant is dissolved in the water sheet and afterwards is degraded through the photocatalytic process (Merai et al., 2019). The most-used photocatalytic material is titanium dioxide (TiO_2) because of its non-toxicity, acceptable production cost and possible anticorrosive properties. The main disadvantage of TiO_2 is related to its UV activation which leads to additional process costs. Recent studies indicate the Vis- or solar-active composite materials (such as TiO_2 - rGO composites) as a solution to overcome the activation problem (Tismanar et al., 2021; Covei et al., 2022). However, for outdoor applications, their stability under environmental conditions (high temperature and humidity or highly corrosive atmospheres) must be analyzed. This research reports on the stability of the TiO_2/TiO_2-rGO double-layered composite thin films deposited on 5x5cm² Al substrates using up-scalable and low-cost deposition methods (spray pyrolysis deposition for TiO_2 intermediate layer coupled with sol-gel spraying for the TiO_2-rGO composite second layer). These coatings were subjected to different accelerated ageing tests with different environmental conditions:
(1) highly corrosive artificial atmospheres to check the possible anticorrosive properties using neutral salt spray (NSS) test according to ISO 9227:2017 and sulfur dioxide (SO_2) test in a humid atmosphere according to ISO 22479:2019, method B
(2) high humidity and temperature (40°C and 100% RH with condensation) according to ISO 6270-2:2017.
Before and after the stability tests, the coatings were analyzed in terms of structure, morphology, surface composition and wettability. The results outline that the samples were mostly affected in the salt environment, where the obtained micrographs show large areas of degraded Al surface, indicating that this type of composite may not exhibit high anticorrosive properties. Instead, after high humidity with condensation and temperature tests the results outline the stability of the coatings (structure and surface properties remain almost unchanged). To check the self-cleaning properties the pristine sample and the most damaged samples (the ones exposed to the corrosive environment) were subjected to photocatalytic tests using the standard methylene blue (MB) pollutant (ISO 10678:2010) and simulated solar radiation but at low irradiance value. The results outline promising efficiency considering the irradiance value (up to 30% after 8h of photocatalysis) on the pristine sample. It is significant to note that even if the coatings were affected by the corrosive environment, their photocatalytic efficiencies decreased only by ~3% concluding that the self-cleaning properties were maintained.

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