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Supervisor Expression of Interest MSCA-IF Marie Sklodowska Curie Action-Individual Fellowship 2020

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Department Name: Research topic: (https://www.polimi.it/en/scientific-research/research-at-the-politecnico/departments/)	Department of Chemistry, Materials and Chemical Engineering "Giulio Natta" (DCMC) Research topic: Smart Coatings for metallic Structures under Cathodic Protection ERC keywords: PE4_16; PE4_18; PE5_8; PE8_9;
MSCA-IF Research Area Panels	<input type="checkbox"/> CHE_Chemistry <input type="checkbox"/> ECO_Economic Sciences <input checked="" type="checkbox"/> ENG_Information Science and Engineering <input checked="" type="checkbox"/> ENV_Environmental and Geosciences <input type="checkbox"/> LIF_Life Sciences <input type="checkbox"/> MAT_Mathematics <input type="checkbox"/> PHY_Physics <input type="checkbox"/> SOC_Social Sciences and Humanities
Politecnico di Milano Areas:	<input type="checkbox"/> Cultural Heritage <input type="checkbox"/> Smart Cities <input checked="" type="checkbox"/> Territorial Fragilities <input checked="" type="checkbox"/> Health <input checked="" type="checkbox"/> Industry 4.0
Brief description of the Department and Research Group (including URL if applicable):	The Natta Department is divided into four main sections: Chemistry, Chemical Engineering, Material Engineering and Biological Engineering. In the last years, the main research activities are focused on energy, safety and environment, biomedical engineering, molecular science, materials engineering and nanotechnology, durability of metal, civil building and cultural heritage, process engineering and manufacturing.



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	<p>The research group PoliLaPP (Laboratory of Corrosion “Pietro Pedefferri”) combines its strong and long experience in the world of corrosion and protection of metals in natural environments (soil, water, atmosphere), in industrial plants (chemical and petrochemical) and in reinforced concrete, with a consolidated competence in training and research activities. PoliLaPP is specialized in the following activities: research in the field of materials corrosion and corrosion prevention, industrial consultancies and corrosion engineering, material selection, corrosion assessment, failure analysis and corrosion tests, customized training courses.</p>
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<p>Brief project description: (max 1 page)</p>	<p>The research project is aimed at the development of innovative stimulus-reactive hybrid coatings, able to improve the corrosion resistance of metallic structures and plants operating under cathodic protection. The coatings developed will be consistent with the logic of sustainable development, thanks to their higher durability, higher protection and adhesion offered by innovative materials used in a traditional sector such as cathodic protection. Furthermore, the activation of the self-repair properties will be stimulated only by the actual needs, i.e., in the presence of significant damages in the coating. This increase in the service life of the coating will result in a reduction in the consumption of raw materials for the repair of damaged coatings, as well as in the reduction of the current demand required to guarantee a safe cathodic protection level. Specifically, self-repairing coatings will be developed as primers that promote the adhesion of subsequent organic coatings. These coatings will be developed by inserting functionalized particles into the organic-inorganic matrix, capable of guaranteeing protection mechanisms through self-repairing action.</p> <p>The self-healing properties will be activated by the cathodic protection itself which induces at the metal-to-electrolyte interface a local variations both in pH (a significant increase is observed up to values close to 10) and in the electric field (modifying the current flow lines).</p> <p>In this context, the research will follow two parallel procedures oriented to the study and develop electro-reactive polymeric substances - sensitive to changes in the electric field - able of expanding reducing the size of the defects, or releasing sealing substances and mesoporous zeolites, functionalized to activate at a pH greater than 9.0-9.5. These systems, by their nature “smart”, are proposed and nowadays used in other fields, as biomedical, to deliver drugs in a targeted way, as well as in corrosion protection in freely corroding structures.</p>
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