Anti-biofouling nanocomposite coatings for bio-threats prevention

Place of work/: The work will be mainly performed at the Laboratory 8.6.42 and 8.4.23.

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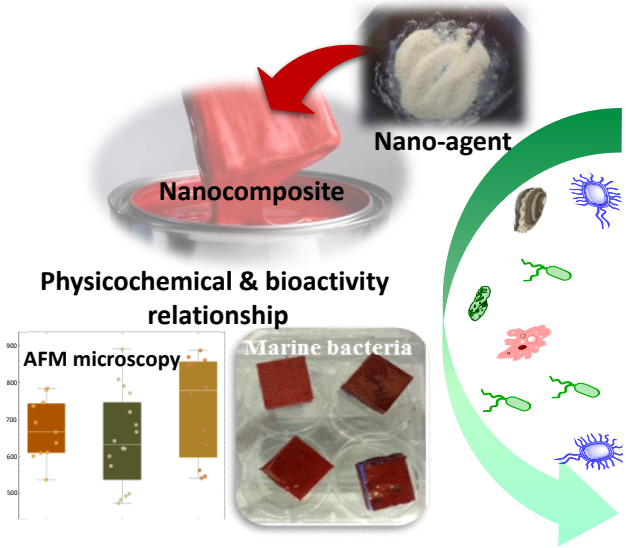
Global efforts have been promoted to face pathogenic bio-threats, since microorganism are prone to colonize and form biofilms on surfaces. These threats are particularly relevant on surfaces in contact with water, such as wastewaters circuits and those highly exposed to pathogens (e.g., water circuits and medical devices in hospitals). Most effective antimicrobial protection strategies on surfaces rely on chemical-based disinfection, which release toxic and persistent agents into the environment, remaining ineffective in preventing biofilm formation and progressive biofouling on surfaces under the current environmental demand and guidelines. In a previous work, newly synthesised bioactive nano-agents demonstrated auspicious antimicrobial effects. This project aims to foster these findings to achieve application validation of the most promising nano-agents as anti-biofouling coatings suitable for various industrial applications, including those involving an aquatic environment (e.g., water treatment, marine infrastructures).
Three interrelated R&D objectives can be outlined:



- Formulate and optimise nanocomposite coatings containing immobilised nano-agents suitable for different applications.
- Investigate the relationship between nanocomposite coatings´ physicochemical properties. The supervisor team provides expertise and specific resources for antifouling coatings development and several AFM facilities essential for the biophysical properties evaluation of the nano-systems. For example, morphological characteristics of surfaces (e.g., roughness, dispersion), and adhesion of organic matter and bacteria on coating films using AFM tip functionalization.
- Evaluate the anti-biofouling potential of nanocomposite coatings under laboratory and simulated conditions. *This part of the work will be performed in collaboration with a partner of an ongoing national collaborative project. During his thesis, the student will be a member of this collaborative project team, with the possibility of continuing his work depending on his performance and goals.*