CERIS Civil Engineering Research and Innovation for Sustainability

WGB_Shield – Shielding Building' Facades on Cities Revitalization. Triple-resistance for Water, Graffiti and Biocolonization of External Thermal Insulation Systems

Summary

This project aims at the development of ETICS the with improved durability in the urban environment, defining performance, durability and ecotoxicity criteria for commercially available solutions. Initially, several different commercially available ETICS systems supplied by three different manufacturers were considered and their water resistance, biological susceptibility and surface properties were evaluated. The durability of these specimens was evaluated and validated through a fine-tuned aging protocol, which consists of hygrothermal, UV and pollutants (SO_2) cycles. The long-term performance in external exposure was also evaluated through natural aging tests (Figure 1). Furthermore, the performance and graffiti-resistance of the several ETICS were analyzed, prior and after the application and removal of graffiti. The bio-susceptibility of ETICS specimens was also evaluated through laboratorial testing, prior and after aging tests. Finally, different case studies (residential buildings in Lisbon) were considered, and mould populations were collected for the identification of microorganisms inhabiting ETICS also using a DNA-based method.

The project's innovation comprises: i) an integrated analysis of the performance, durability, maintenance and ecotoxicity of surfaces, combining urban agents and creating sustainable rehabilitation solutions; ii) a new set of performance and ageing tests simulating real urban conditions; and iii) developing integrated protection-repair solutions that combines advanced and sustainable materials.

The final output of the project corresponds to: an innovative methodology for evaluating protection degrees (WGB_Shield) on ETICS surfaces to water resistance, graffiti and biocolonization, to be included in a LNEC specification; and the application of integrated protective-repair solutions in pilot urban areas (Figure 2), involving managing entities of built heritage.

All research team has extensive experience in the development and technical compliance of coatings and insulation systems, and integrates a multidisciplinary knowledge in the fields of civil engineering, chemistry, nanotechnology and biotechnology. The project has also received support from several ETICS manufacturers. At CERIS, a special focus will be given to the development of anti-graffiti treatments, due to the widespread diffusion of this phenomenon in urban areas. IST and LNEC are working together in all tasks of the project, with the help of PhD researcher G. Borsoi, which won a CERIS seed project in 2021 (7 500€) – Bi-THERM – aims to design and development a bio-hygrothermal model for ETICS, based on field experimental sensor monitoring. https://ceris.pt/2020/07/07/bi-them/.

Figure 1. On the left: ETICS solutions; at the centre: Uv-IR irradiation aging tests; on the right: freeze-thaw cycles artificial aging tests.

Figure 2. Pilot applications of ETICS and protective solutions at walls prototypes.

Project Reference

PTDC/ECI-EGC/30681/2017

Leading Institution

IST-ID – Associação do Instituto Superior Técnico para a Investigação e Desenvolvimento (Portugal)

Partners

LNEC – National Laboratory for Civil Engineering (Portugal)

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Total

221 351.00€

CERIS

155 126.00€

Project Website

http://www.lnec.pt/en/estudos/detalhes.php?tipo=0&id=327