XV International Conference on Durability of Building Materials and Components
DBMC 2020, Barcelona
C. Serrat, J R Casas and V. Gibert (Eds)

In-Situ Tests on Silica Aerogel-Based Rendering Walls

Inês Flores-Colen[1], Marco Pedroso[2], António Soares[3], Maria da Glória Gomes[4], Nuno M. M. Ramos[5], Joana Maia[6], Rui Sousa[7], Hipólito Sousa[8] and Luís Silva[9]

[1] Associate Professor, CERIS, Instituto Superior Técnico, Universidade de Lisboa, Av. Rovisco Pais, 1049-001 Lisbon, Portugal, ines.flores.colen@tecnico.ulisboa.pt
[2] PhD student, CERIS, Instituto Superior Técnico, Universidade de Lisboa, Av. Rovisco Pais, 1049-001 Lisbon, Portugal, marco.pedroso@tecnico.ulisboa.pt
[3] Post-doc researcher, CERIS, Instituto Superior Técnico, Universidade de Lisboa, Av. Rovisco Pais, 1049-001 Lisbon, Portugal, ortiz.soares@gmail.com
[4] Assistant Professor, CERIS, Instituto Superior Técnico, Universidade de Lisboa, Av. Rovisco Pais, 1049-001 Lisbon, Portugal, maria.gloria.gomes@tecnico.ulisboa.pt
[5] Assistant Professor, CONSTRUCT, Faculdade de Engenharia, Universidade do Porto, Rua Dr. Roberto Frias, 4200-465 Porto, Portugal, nuno.ramos@fe.up.pt
[6] Researcher, CONSTRUCT, Faculdade de Engenharia, Universidade do Porto, Rua Dr. Roberto Frias, 4200-465 Porto, Portugal, joanamaia@fe.up.pt
[7] Researcher, CONSTRUCT, Faculdade de Engenharia, Universidade do Porto, Rua Dr. Roberto Frias, 4200-465 Porto, Portugal, ruysousa@fe.up.pt
[8] Associate Professor, CONSTRUCT, Faculdade de Engenharia, Universidade do Porto, Rua Dr. Roberto Frias, 4200-465 Porto, Portugal, hipolito@fe.up.pt

Keywords: *In-Situ Tests, Renders, Aerogel, Walls, Performance.*

1 Introduction

On-site performance testing of renders avoids subjective diagnosis and contribute to a better understanding of render behavior under natural exposure conditions. In this paper, several in-situ techniques are applied on wall prototypes with different formulations of aerogel-based renders, in order to discuss the mechanical, water resistance, and thermal performance.

2 Conclusions and Future Developments

This paper contributes to the discussion of the performance of aerogel-based renders on walls prototypes. The results showed that these renders have excellent thermal behaviour but with specific characteristics in terms of compressive strength and water resistance.

The in-situ testing and lab testing on the collected samples confirm the mechanical, water-resistance and thermal performance of the applied aerogel-based renders. These renders tend to have lower compressive strength, low compactness but high surface deformability. Because of the low weight of these renders and low susceptibility to thermal gradients (lower values of thermal conductivity), the solutions are stable after application, despite of having reduced adhesion values.

The water resistance of these renders depends on the paste formulation notwithstanding the hydrophobic nature of the aerogel. However, the common application of a compatible

multilayer coating system improves the water behavior of the complete render system (thermal render + multilayer coating system).

In-situ tests are relevant techniques to monitor the performance of aerogel-based renders and to give additional information to numerical simulations of these renders. However, some drawbacks can be highlighted, specially when multilayers systems are applied. For example, in-itu measurements of thermal conductivity with ISOMET technique are reliable only on aerogel-based renders without thin coating systems. Further research should discuss the thermal performance of these multilayer systems based on the thermal resistance.

Acknowledgements

The authors gratefully acknowledge the support of CERIS Research Centre, IST - University of Lisbon, Portuguese FCT - Foundation for Science and Technology, Saint-Gobain Weber Portugal, and COMPETE 2020 project POCI-01-0247-FEDER-017417. The second author also wants to thank FCT for PhD grant SFRH/BD/132239/2017.

ORCID

Inês Flores-Colen: https://orcid.org/0000-0003-4038-6748
Marco Pedroso: https://orcid.org/0000-0002-8119-6847
António Soares: https://orcid.org/0000-0002-0377-1295
Maria da Glória Gomes: https://orcid.org/0000-0003-1499-1370
Nuno M. M. Ramos: https://orcid.org/0000-0002-5331-7429
Joana Maia: https://orcid.org/0000-0001-5036-8581
Hipólito Sousa: http://orcid.org/0000-0001-8335-0898
Rui Sousa: http://orcid.org/0000-0003-3855-3252

References

Duarte, R., Flores-Colen, I., de Brito, J. and Hawreen, A. (2020). Variability of in-situ testing in wall coating systems - Karsten tube and moisture meter techniques. *Journal of Building Engineering*, 27, 100998. doi: 10.1016/j.jobe.2019.100998

Flores-Colen, I., Manuel Caliço Lopes de Brito, J. and Peixoto de Freitas, V. (2011). On-site performance assessment of rendering façades for predictive maintenance. *Structural Survey*, 29(2), 133–146. doi: 10.1108/02630801111132812

Flores-Colen, I., Silva, L., de Brito, J. and Peixoto de Freitas, V. (2010). In-service parameters from façade rendering mortars. *Structural Survey*, 28(1), 17–27. doi: 10.1108/02630801011040833

Menezes, A., Glória Gomes, M., and Flores-Colen, I. (2015). In-situ assessment of physical performance and degradation analysis of rendering walls. *Construction and Building Materials*, 75, 283–292. doi: 10.1016/j.conbuildmat.2014.11.039

Pedroso, M., Flores-Colen, I., Dinis Silvestre, J., Gomes, M. G., Silva, L. and Ilharco, L. (2019). Physical, mechanical and microstructural characterization of a thermal insulating render incorporating silica aerogel: nanoSIR. *Energy and Buildings*, 211, 109793: doi.org/10.1016/j.enbuild.2020.109793

Sousa, R., Sousa, H., Silva, L., Flores-Colen, I. and Pedroso, M. (2019). Development of a wall system made with thermally optimized masonry and super insulation mortar render. *Masonry International*, 32(1), 3–14: www.scopus.com.