



XIII ENCMP

IV RGC

**XIII Encontro Nacional de
Catálise e Materiais Porosos**

IV Reunião do Grupo do Carbono

BOOK OF ABSTRACTS

15-17 June 2026
ISEL, Lisboa, Portugal



**Ciências
ULisboa**



TÉCNICO
UNIVERSIDADE
DE LISBOA

ISEL

Instituto
superior de
engenharia
de Lisboa

NOVA
UNIVERSIDADE NOVA
DE LISBOA



**Sociedade Portuguesa
de Química**

XIII Encontro Nacional de Catálise e Materiais Porosos

IV Reunião do Grupo do Carbono

15-17 June 2026

ISEL, Lisboa, Portugal

Book of Abstracts

TECHNICAL SHEET

TITLE

XIII Encontro Nacional de Catálise e Materiais Porosos e IV Reunião do Grupo do Carbono

PUBLISHER

Sociedade Portuguesa de Química
Av. Prof. Gama Pinto 2, 1649-003 Lisboa

DATE

June 2026

ISBN (DIGITAL VERSION)

978 989 8124 55 5

RECOMMENDED CITATION

XIII Encontro Nacional de Catálise e Materiais Porosos e IV Reunião do Grupo do Carbono, Instituto Superior de Engenharia de Lisboa (ISEL), Lisboa, Portugal (2026)

Only minor editorial changes were made to the original texts submitted by the authors. These changes aim solely to improve clarity and did not alter the scientific content. The authors are fully responsible for the scientific content of their contributions.

© Portuguese Chemical Society

All rights reserved. No part of this document may be reproduced in any form or by any means without prior written permission from the editors.

Keynote 2

Activated carbon adsorption in water treatment - an expanding application

M.J. Rosa^{a,*}, A.S. Mestre^b, C. Silva^a, E. Mesquita^a, M. Campinas^a, A.P. Carvalho^b, R. Viegas^a

^a Urban Water Unit, Hydraulics and Environment Department, LNEC - National Laboratory for Civil Engineering, Av. Brasil 101, 1700-066 Lisboa, Portugal ^b Centro de Química Estrutural, Institute of Molecular Sciences, Departamento de Química e Bioquímica, Faculdade de Ciências, Universidade de Lisboa, Campo Grande, 1749-016 Lisboa, Portugal

* E-mail: mjrosa@lnec.pt

Scientific topic: Invited communication

Population growth, water scarcity, and climate change are driving the need for enhanced control of organic micropollutants and contaminants of emerging concern (CECs) in the urban water cycle¹. This has led to a reinforced European and Portuguese legal framework, including the Drinking Water Directive (EU) 2020/2184 (DWD) and its Portuguese transposition DL 69/2023, the Urban Wastewater Treatment Directive (EU) 2024/3019 (UWWTD), and Regulation (EU) 2020/741 on water reuse. Activated carbon adsorption is considered a best available technology for removing these challenging contaminants, such as pharmaceuticals, pesticides, and cyanotoxins, from both drinking water and treated wastewater¹. The global activated carbon market is therefore expanding, with water and wastewater treatment applications representing approximately 42,5% of the market share in 2025 and serving as a primary growth driver². This communication focuses on the application of powdered activated carbon (PAC) and granular activated carbon (GAC) in drinking water and urban wastewater treatment (DWT, UWWT)^{1,3}. Conventional PAC application involves addition during coagulation/flocculation/sedimentation (PAC-C/F/S) often followed by filtration, whereas innovative hybrid PAC/low-pressure membrane processes (e.g., PAC/MF or PAC/UF) adds a physical barrier against microbial pathogens and fine PACs that minimize carbon footprint and byproduct formation¹. In UWWT, PAC may also be applied to the activated sludge reactor (PAC/AS)^{1,4}, a low-investment solution. GAC is typically used in fixed-bed or fluidized-bed filters in DWT and UWWT³. Current technological needs emphasize sustainability and circular economy, such as valorising local biomass, e.g. Portuguese pine nut shells to produce high-performing carbons⁵, or UWWT-sludge carbonization to produce biochar for PAC/AS⁶, closing the cycle. In addition to better and agile process modelling and engineering⁷, key improvement needs include enhancing adsorption kinetics through super-fine PAC, developing magnetic PACs to allow for efficient PAC recovery and regeneration or Ag-doped GACs for controlling biofilm growth. Several key projects have supported the research and demonstration of these advanced materials and treatment technologies for DWT (LIFE Hymemb, FCT EMPOWER+, CYTED-Recircula), UWWT (LIFE Impetus, LIFE ReFitting), non-potable water reuse (FP7 TRUST) and direct potable water reuse⁸ (H2020 B-WaterSmart).

References

- 1 M. J. Rosa, M. Campinas, C. Silva, E. Mesquita and R. M. C. Viegas, in *Clean Technologies Toward the Development of a Sustainable Environment and Future*, IWA Publishing, London, UK, 2023, Chapter. 8, pp. 141–180, DOI: [10.2166/9781789063783_0141](https://doi.org/10.2166/9781789063783_0141)
- 2 <https://www.grandviewresearch.com/industry-analysis/activated-carbon-market>
- 3 A. S. Mestre, M. Campinas, R. M. C. Viegas, E. Mesquita, A. P. Carvalho and M. J. Rosa, in *Advanced Materials for Sustainable Environmental Remediation*, Elsevier, MA, USA, 2022, Chapter. 17, pp. 433–475, DOI: [10.1016/B978-0-323-90485-8.00001-1](https://doi.org/10.1016/B978-0-323-90485-8.00001-1)
- 4 M. Campinas, R. M. C. Viegas, C. M. M. Almeida, A. Martins, ..., M. J. Benoliel and M. J. Rosa, *J. Water Process Eng.*, 2022, **49**, 102975, DOI: [10.1016/j.jwpe.2022.102975](https://doi.org/10.1016/j.jwpe.2022.102975)
- 5 A. S. Mestre, R. M. C. Viegas, E. Mesquita, M. J. Rosa and A. P. Carvalho, *J. Hazard. Mater.*, 2022, **437**, 129319, DOI: [10.1016/j.jhazmat.2022.129319](https://doi.org/10.1016/j.jhazmat.2022.129319)
- 6 M. Bagheri and E. Wetterlund, *Waste Manage.*, 2023, **170**, 131–143, DOI: [10.1016/j.wasman.2023.08.006](https://doi.org/10.1016/j.wasman.2023.08.006)
- 7 R. M. C. Viegas, A. S. Mestre, E. Mesquita, M. Machuqueiro, M. Andrade, A. P. Carvalho and M. J. Rosa, *Water*, 2022, **14**, 166, DOI: [10.3390/w14020166](https://doi.org/10.3390/w14020166)
- 8 R. M. C. Viegas, D. Figueiredo, E. Mesquita, S. Charrua, C. Costa, R. Lourinho and M. J. Rosa, *Sep. Purif. Technol.*, 2025, **372**, 133419, DOI: [10.1016/j.seppur.2025.133419](https://doi.org/10.1016/j.seppur.2025.133419)