

Book of Abstracts

of the

Symposium on Environmental Engineering

Editors:

Ana Silva, Carla Santos, Filipe Francisco, Inês N. Rodrigues,
Inês M. Rodrigues, Juliana Sá, Orleane Brito,
Luiza Sena, Miguel Costa, Tânia Silva,
Sofia Sousa, Vítor Vilar

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LEADING THE CHANGE FOR A GREENER FUTURE

SYMPOSIUM ON ENVIRONMENTAL ENGINEERING



This volume contains the peer-reviewed and accepted abstracts presented at the Symposium on Environmental Engineering of the 6th Doctoral Congress in Engineering – DCE25, held at the Faculty of Engineering of the University of Porto (FEUP), between June 30th and 1st July, 2025.

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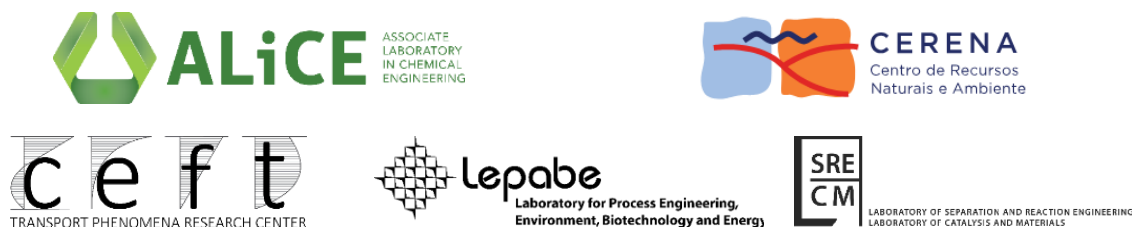
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WELCOME

Message from the Organizing Committee

We warmly welcome all participants to the Symposium on Environmental Engineering (SEE), held in the scope of the 6th Doctoral Congress in Engineering (DCE25), hosted at the Faculty of Engineering of the University of Porto (FEUP), Portugal, on the 30th June and 01st July 2025.

This Symposium is organized by PhD students of the Doctoral Program in Environmental Engineering (PDEA) at FEUP, with the support of the Associate Laboratory ALiCE (integrating the R&D Units LEPABE, LSRE-LCM and CEFT) and CERENA.



The Symposium covers a wide range of themes in the field of Environmental Engineering, aligned with the UN Sustainable Development Goals. It includes both oral and poster presentations, mainly covering the following topics:

- Water and Wastewater: New Directives, New Opportunities, New Challenges
- Waste Management: Towards New Approaches
- Clean Air and Energy: Becoming Accessible for All
- Sustainability and Innovation: Seeking a New Future

We are truly grateful to our invited speakers for accepting our invitation and sharing their expertise, thereby enhancing the quality and impact of the Symposium.

The Symposium received 81 submissions, reviewed with the support of the Scientific Committee, resulting in 17 oral and 64 poster presentations.

We would like to take this opportunity to express our sincere appreciation to all authors for their valuable contributions, as well as to the Symposium Organizing Committee, the Scientific Committee, Associate Laboratory ALiCE (comprising the R&D Units LEPABE, LSRE-LCM, and CEFT), CERENA, and all participating institutions for their invaluable support.

Porto, June 2025

The Symposium Organizing Committee

PC 36. A New Flight for Plastic Waste: Catalytic Conversion of LDPE Powder Into Sustainable Aviation Fuel

M.R.T.O. Costa^{1,2}, K.K. Ferreira^{1,2}, L.S. Ribeiro^{1,2}, J.J.M. Órfão^{1,2}, M.F.R. Pereira^{1,2}

¹LSRE-LCM – Laboratory of Separation and Reaction Engineering - Laboratory of Catalysis and Materials, Faculty of Engineering, University of Porto, Rua Dr. Roberto Frias, 4200-465 Porto, Portugal

²ALiCE – Associate Laboratory in Chemical Engineering, Faculty of Engineering, University of Porto, Rua Dr. Roberto Frias, 4200-465 Porto, Portugal

Presenting author email: up202004876@up.pt

Abstract

The aviation sector was responsible for 2.5 % of all energy-related CO₂ emissions in 2023, with its emissions increasing more rapidly than rail, road, or maritime transport sectors since 2000 [1], yet current technologies for Sustainable Aviation Fuels (SAF) remain underdeveloped [2]. Simultaneously, plastic waste production is ever-increasing, but plastic waste management solutions remain insufficient [3]. This study aims to develop a possible synergetic solution for both issues by developing heterogeneous catalysts for producing aviation fuels from commercial low-density polyethylene (LDPE) powder. Firstly, 2.5 wt.% of Ru was impregnated on oxidised carbon nanotubes (CNT_{ox}). In addition, two zeolites were calcined at 600 °C to obtain their acid forms (H-Y and H-ZSM-5). The catalytic cracking tests were performed in a 100 mL stainless steel Parr batch reactor. In a typical run, 5 g of LDPE and 0.5 g of each catalyst were loaded into the reactor. The initial H₂ pressure was adjusted to 40 bar. The reactions were performed at 300 °C and 400 rpm of stirring rate for 4 h. The liquid products were analysed by gas chromatography-mass spectrometry (GC-MS), and the gaseous products were analysed using a GC-flame ionisation detector (GC-FID). Among the different catalysts tested, a mixture of Ru/CNT_{ox} and H-Y presented the best combination, taking into consideration the highest selectivity (65.4 %) in terms of SAF hydrocarbons (C₈-C₁₆) as well as the conversion (96.8 %). This combination presented better results when compared to either the Ru/CNT catalyst or the H-ZSM-5, suggesting that the acidity of the Ru/CNT_{ox} and H-Y favoured the required cracking reactions.

Acknowledgments

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