



Z·ONA4LIFE

Aluminum foundries circularity via holistic zeolite production

1st Conference on Zeolites > Sustainable Zeolites: Advances in Synthesis and Applications

6 November 2024
Madrid, Spain



Co-funded by
the European Union

Event Background

The First Conference on “Sustainable Zeolites: Advances in Synthesis and Applications” took place at the campus of [Instituto de Ciencias de la Construcción Eduardo Torroja \(IETcc-CSIC\)](#) in Madrid, Spain. The full-day event was part of the **dissemination activities of the Z-ONA4LIFE project**, which aims to show, on a pilot scale, that making synthetic zeolite is a practical and cost-effective technology to advance aluminium circular foundries.

Organised by Z-ONA4LIFE project coordinator, **Grupo Medes (IETcc-CSIC)**, in collaboration with [Trust-IT Services](#), the event provided a **platform for researchers, scientists and industry professionals** to share and exchange knowledge on the **latest advancements being made in the field of zeolites** and spotlight the alternative research efforts being made to achieve cleaner and more sustainable processes for the production of zeolites.

Zeolites are crystalline solid materials that possess regular porous structure. Their distinctive properties and unique formation provide value across industries, serving various purposes such as water remediation, catalysis, detergent building, gas purification, membranes, and drying processes, among others.

While zeolites exist naturally in the world, Z-ONA4LIFE is aiming to produce synthetic zeolites through an efficient process that involves recycling aluminium waste, or salt slag, and combining with silicon to generate the powder substance known as zeolites.

This innovative synthesis process attempts to demonstrate novel best practices for waste recovery and encourage resource reduction to limit the environmental impact of hazardous materials.



Contributions / Discussion

Leading up to the November event, Z-ONA4LIFE invited submissions of original research papers, case studies, and reviews for presentation at the conference. The event placed special emphasis on innovative synthesis routes using unconventional raw materials, as well as on the emerging applications of zeolites in various industries, regulatory aspects of zeolite adoption and the barriers in the development of industrial-scale levels of zeolite production.

Each expert presented a unique perspective from their specific domain, the methodologies to advance more sustainable synthesis processes aimed at minimising the consumption of raw materials, reducing economic costs and decreasing the environmental impact of waste behaviours.

Following opening remarks from **Dr. José Luis García Calvo**, Technical Vice Director at IETcc-CSIC, and a presentation on the background of the event from **Dr. Aurora López Delgado**, researcher at IETcc-CSIC, invited lecturer **Dr. Joaquín Pérez-Pariente**, Professor at the Institute of Catalysis and Petrochemistry (ICP-CSIC), led the day off with a presentation on “*Approaches to the design of zeolite synthesis for catalytic applications*”, expanding on the different parameters involved in various catalytic zeolite success stories and the questions scientists are still seeking to answer.

Session 1: Synthesis of zeolites

The first session of the day was moderated by **Dr. Carmen Lobo**, researcher at IMIDRA. She handed the microphone to **Dr. Jose Manuel Moreno Maroto**, researcher at the Autonomous University of Madrid (UAM), who demonstrated hydrothermal zeolitization as a solution to reduce the environmental damages caused by marine litter in his discussion entitled, “*Zeolitization as a method of manufacturing lightweight structural materials from kaolin and marine plastic waste*”.

Dr. Isabel Díaz, researcher at ICP-CSIC, took the stage next to discuss how her team is investigating the novel synthesis, characterisation and application of zeolites in water purification.

Dr. Germán Sastre from the Institute of Chemical Technology (ITQ, UPV-CSIC), continued Session 1 by highlighting a computation study on how to synthesize aluminium silicates.

Dr. Sol López Andrés is a Professor at Comptense University of Madrid (UCM), working on a team to transform hazardous volcanic ash into zeolites through hydrothermal synthesis to prevent the distribution of this classified harmful waste into landfills.

Rita Giuffrida, Project Manager at Trust-IT Services, closed the morning session by providing an alternative perspective of zeolite synthesis from waste from the policy perspective of the European Union and the need to push the versatility of zeolites into mainstream sustainability conversations.



Session 2: Catalytic, adsorption and remediation applications

Session 2, moderated by **Dr. Sol López Andrés**, began with back-to-back presentations from **Dr. María del Mar Gil-Díaz**, researcher at IMIDRA, who analysed the feasibility of sustainable zeolites for soil decontamination, specifically touching on the effectiveness of zeolites, and their absorption properties, in limiting the mobility of metal pollutants in soil.

Danilo Jara Echeverría, researcher at Polytechnic University of Madrid (UPM), presented on how synthetic zeolites have the capacity to reduce the acidity of soil, specifically as it relates to contaminated mining areas and limiting the mobility of dangerous metals in the ground.

Rafael Carrizosa, researcher at IETcc-CSIC, finished off Session 2 and led us into lunch with an overview of salt slag management, specifically expanding the developments of his team at IETcc-CSIC in transforming aluminium salt slag into synthetic zeolite, as part of the Z-ONA4LIFE consortium.

Session 3: Applications in the construction sector

Session 3 after lunch, the final session of the day, focused on the impact of zeolites in the construction sector, including two discussions on the interplay between zeolites and cement. **Dr. Leticia Presa**, researcher at UPM, led off with her presentation entitled, "*Sustainable cements from natural mordenite as a supplementary cementitious material*", which demonstrated investigations being made that test the capacity of synthetic zeolites to limit cement CO2 emissions.

Dr. Pedro Carballosa, Materials Engineer from IETcc-CSIC, followed next with an exploration of how synthetic zeolites are being used as additions to cement-based materials to reduce the environmental impact of construction-based materials.

Dr. Tomas Bajda, Professor at AGH University of Krakow, expanded on how his research committed to the transformation of fly ash, a byproduct of coal combustion, into zeolite materials is an encouraging solution within the construction materials industry.

Dr. Miguel Ángel Cambor from the Institute of Materials Science of Madrid (ICMM-CSIC), was invited to conclude the day of presentations in which he dedicated his time to evaluate stable zeolites with three-dimensional extra-large pore systems.

Symposium: The Role of Zeolite Associations

After the final presentation, **Dr. Enrique Sastre** (Institutional Delegate of the CSIC in the Community of Madrid), **Dr. Isabel Díaz** (ICP-CSIC), **Dr. Joaquín Pérez-Pariente** (ICP-CSIC), and **Dr. Miguel Ángel Cambor** (ICMM-CSIC) came together as a panel to provide an overview of the Association of Zeolites and its importance in promoting the technical and scientific research achievements in the field of zeolites, as well as to encourage collaboration and knowledge sharing within the greater zeolite community.



Outcomes

The Z-ONA4LIFE project is designed to foster a sustainable and circular future for the aluminium industry by informing and spotlighting waste management best practices and setting a precedent for global environmental stewardship. As the project evolves and technical advancements continue to not only elevate the circulatory of aluminium foundries, but as we saw in the range of presentations, the integration of Z-ONA zeolites will be valuable in other markets as well.

This forum highlighted the growing demand for sustainable solutions to not only adhere to European sustainability objectives, highlighting the capacity of synthetic zeolites as a tool to push Europe forward down a circular path, but how zeolites can be used in a wide-range of industrial applications, becoming a catalyst for waste management best practices.

This 1st Conference on Sustainable Zeolites captured a snapshot of the technical progress being made in the field of zeolites. While our experts and their teams continue to pursue ambitious innovations to protect our environment and improve living conditions in society, it is imperative to highlight their ongoing efforts to educate the public and support a shift towards more sustainable behaviours.



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