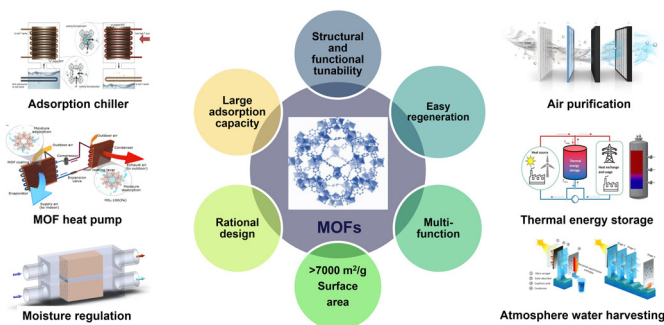


Smart Materials for Energy-Efficient Heating, Cooling and Indoor Air Quality Control in Residential Buildings

EBC ANNEX 92

This project is developing energy-efficient heating, cooling and air purification strategies by using novel smart materials, especially advanced sorbents, such as metal-organic frameworks and their related composites, through cross-disciplinary international collaboration. The project plans to gather existing scientific knowledge and data on novel sorbent materials for cooling/dehumidification, pollutant removal, heating and energy storage. In addition, this project will study current and innovative use of these materials in air-conditioning, air purification, and thermal storage systems. Further, this project will help to identify and bridge knowledge gaps by establishing links between different disciplines. In the project, experts from building science, materials chemistry, mechanical engineering, material sciences, and environmental health are working together with other stakeholders to accelerate the development of better and more energy-efficient heating, cooling, and indoor air quality control systems by using advanced materials.



Metal-organic frameworks (MOFs) and their application for built environment control.

Source: EBC Annex 92

PROJECT OBJECTIVES

- 1 develop energy-efficient heating, cooling and air purification strategies by using novel smart materials, especially advanced sorbents (MOFs and hydrogels) and their related composites, through a cross-disciplinary international collaboration,
- 2 review, analyse, and evaluate novel sorbent materials, and develop or further improve the performance of selected materials for specific applications in different climates,
- 3 develop suitable shaping methods of the best sorbents to adapt to the criteria for the different applications,
- 4 develop innovative heating and heat storage systems using new sorbent materials,
- 5 identify or further develop innovative cooling systems using new materials,
- 6 develop innovative active and passive approaches for air purification systems using new sorbent materials,
- 7 carry out laboratory tests to measure the performance of the new systems, along with numerical modeling and optimization,
- 8 develop guidelines for design and control strategies for novel systems, supported by models and tools to assist designers and managers of buildings in their use, and
- 9 document relevant case studies, focusing on performance and optimization.

INTERNATIONAL ENERGY AGENCY

The International Energy Agency (IEA) was established as an autonomous body within the Organisation for Economic Co-operation and Development (OECD) in 1974, with the purpose of strengthening co-operation in the vital area of energy policy. As one element of this programme, member countries take part in various energy research, development and demonstration activities. The Energy in Buildings and Communities Programme has co-ordinated various research projects associated with energy prediction, monitoring and energy efficiency measures in both new and existing buildings. The results have provided much valuable information about the state of the art of building analysis and have led to further IEA co-ordinated research.

EBC VISION

By 2030, near-zero primary energy use and carbon dioxide emissions solutions have been adopted in new buildings and communities, and a wide range of reliable technical solutions have been made available for the existing building stock.

EBC MISSION

To accelerate the transformation of the built environment towards more energy efficient and sustainable buildings and communities, by the development and dissemination of knowledge and technologies through international collaborative research and innovation.

The following project deliverables are planned:

- literature list for energy efficient energy management: This deliverable will provide a comprehensive overview of all the literature that was used and highlighted during the project.
- An overview report on methods and tools for selecting smart materials for energy-efficient cooling, dehumidification, indoor air quality (IAQ) control and thermal energy storage strategies: This deliverable will provide professionals and practitioners with a collection of methods and tools for IAQ management strategy.
- A collection of scientific publications in high-level journals: This deliverable will bring together scientific publications from all project subtasks.
- A collection of case studies and demonstrations of energy-efficient heating, cooling and thermal energy storage using smart materials: This deliverable will provide both policy makers and industry practitioners with an overview of current practices and real-life examples of energy-efficient built environment control strategies using novel smart materials.

Project duration

Ongoing (2024 - 2028)

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Participating countries (provisional)

Australia, Belgium, Brazil, Canada, P.R.China, Denmark, France, Germany, Korea, Norway, Portugal, Sweden, USA

Further information

www.iea-ebc.org