

# **SUPERCRITICAL FLUIDS AND MATERIALS NETWORK**

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## **INTRODUCTION**

Sustainability has become a leading strategy for new successful product and process development for the 21<sup>st</sup> century. Therefore new industrial processes, which offer ecological, economical and social advantages, are demanded. New processes using supercritical fluids, which improve current ones in simplicity, energy saving, recycling and in the quality of obtained products, constitute clean processes in the frame of environmentally respectful technologies.

In this context and in the frame of the European Community initiative programme INTERREG III B “Atlantic Area”, a transnational network of universities, research centres, technology transfer centres and SME with complementary equipments and expertises has been set up. The SUPERMAT (SUPERcritical Fluids & MATerials) network aims to encourage technology transfer initiative in the field of supercritical fluids targeting industries in the Atlantic Area. Expected results are to identify and reinforce technological potential of supercritical fluids in order to bring innovation to SMEs in this Area.

## **THE SUPERMAT PROJECT**

The SUPERMAT project is funded under the EC’s INTERREG III B “Atlantic Area” Programme. This covers the peripheral areas of Europe that border the Atlantic Ocean – that’s all of Ireland and Portugal, and parts of Spain, the UK and France. This initiative was set up to bring about economic and social cohesion across these Member States through greater transnational co-operation. Regarding the general and specific objectives of the programme INTERREG III B “Atlantic Area” i.e.:

- To develop trans-national cooperation via collaboration procedure (networking of Atlantic actors);
- To encourage the economic competitiveness and effectiveness of the Atlantic Area in order to overcome the handicaps of its location in relation to the rest of Europe, and to promote the integration of workforces and the strengthening of their skills;
- To encourage the coherence and cohesion of the Atlantic Area, both to affirm its identity as a group of regions and to increase its relation with other regional groups within the European Union with a view to enlargement, the aim being to develop better integration between partners inside and outside the Atlantic Area;

9 partners from 4 European countries belonging to the Atlantic Area have decided to create a network. This network therefore set out to make Supercritical Fluids better known to SMEs throughout Atlantic Area, thus promoting new applications, improvement and transfer of

supercritical fluid technology. The creation of this network will have structuring and integrating effects on technology transfer in the field of supercritical fluid by joining unique competencies, manufacturing techniques and characterization capabilities. This approach will optimise resources employed to get maximum results in different industrial sectors such as material processing, waste treatment and environment thus benefiting the Atlantic Area from a technological viewpoint. This network will increase the research and technology transfer potential and avoids duplicate efforts in the same research lines. Greater cohesion in this proposed network will be based on: sharing and leveraging best experiences, fast transfer of technology, the stimulation of mobility of researchers and better use of instruments and resources.

## THE SUPERMAT CONSORTIUM

The SUPERMAT network comprises individual experts and competent organisation involved in Supercritical Fluid Technology. The member's expertise areas and backgrounds include inorganic synthesis, modelling, thermodynamic, waste treatment, powder processing, extractive applications for food industries and technology transfer. It includes university departments, research & development institutions, technology transfer centres and an SME.

### *Project lead partner:*

· **ADERA - Supercritical Fluids and Materials Transfer Unit - France:** A private, non-profit making technology centre, serving the industrial community through technology transfer and involved in Materials Technology, Industrial Processes and the Environment. The Supercritical Fluids & Materials Transfer Unit is attached to the Institute of Condensed Matter Chemistry of Bordeaux and serves as a gateway to the resources and expertise of this Institute in the field of material processing using supercritical fluids. The main aim of this Transfer Unit is to encourage technology transfer initiative. In this context, this unit provides technical services and consultancy to companies.

### *Partners:*

- **Ecole des Mines d'Albi-Carmaux - France:** The Chemical Engineering Laboratory for Particulate Solids is a joint laboratory between the Ecole des Mines and the CNRS. In this lab, a team is specialist in particle formation from supercritical fluids (experimental and modelling). Specific applications: particle design for industrial applications, solid solubilities in SC-fluids, modelling of anti-solvent process
- **Fundación General Universidad de Valladolid (FGUVA) - Spain:** A private, non profit, research organisation attached to the University of Valladolid. The Chemical Engineering Department of the University of Valladolid is an active research department in environmental and industrial process development. The group that participate in this project is actively involved in pilot plant studies to develop new processes with supercritical fluids. The group facilities are pilot and demonstration plant for supercritical water oxidation process and pilot plant for materials processing using supercritical fluids.

- **Hydrothermal Oxidation Option (HOO) - France:** A spin off company specialist in supercritical fluid process engineering and actively involved in waste treatment using supercritical fluids.
- **Institute of Condensed Matter Chemistry of Bordeaux (ICMCB) - France:** Academic research centre of French National Centre for Scientific Research (CNRS). ICMCB is a public basic research centre that defines its mission as producing knowledge, formation by research and technology transfer to society. Twenty five people of ICMCB work in the field of supercritical fluids. This team is actively involved and act as international expert in waste treatment and material processing using supercritical fluids.
- **Instituto de Biologia Experimental e Tecnológica (IBET) - Portugal:** This is a private, non-profit, contract research organisation, closely related to the New University of Lisbon. It has a diversified expertise in high-pressure carbon dioxide technology and applications. Its pilot plant will be used for training of researchers from other partners in the network, and for the production of samples for demonstration purposes in technology transfer activities.
- **Laboratoire Thermique Energétique et Procédés (LaTEP) - France:** LaTEP is a French laboratory which works on thermal problems and chemical engineering. The activities the group “chemical engineering” are especially orientated to drying/filtration and modelling of chemical reactors. This last team has a particular interest about the chemical reactions in supercritical fluids.
- **National University of Ireland, Cork (NUIC) - Ireland:** The *Dimensional Solid Research Group* is part of the Chemistry Department at NUIC and was established in 1999. The group comprises of 20 scientists and is led by Drs Holmes and Morris. The overall remit of the group is to explore and understand the effects that dimensionality have on the physical and chemical properties of materials using state-of-the-art spectroscopic equipment and techniques. The group avails staff possessing expertise in the following areas: materials science, supercritical fluid technology, colloidal chemistry, surface science, electrochemistry and analytical chemistry.
- **University of Cádiz (UCA) - Spain:** A public institution, where the Research Group “Analyses and Design of Supercritical Fluids Processes” focus its work in the Supercritical Fluid Technology (concretely, in the study of high pressure fluid phase equilibriums, supercritical extraction processes and supercritical water oxidation processes). The works published until today endorse the experience that this group has in this field.

## ACTIVITIES

The SUPERMAT partners have defined the following specific objectives:

- To develop the competitiveness of the Atlantic Area in terms of technological innovation using supercritical fluids. This network will promote a new innovative technology within the Atlantic Area. Expected results are to identify and reinforce technological potential of supercritical fluids in order to bring innovation to SMEs in the Atlantic Area;
- To foster the development of exchanges and cooperation between research partners, technology transfer units and SMEs within the Atlantic Area;
- To reinforce sustainable development initiatives within the Atlantic Area regions.

In order to reach these objectives, the following activities will be undertaken:

- To initiate and coordinate research activities and to link research to the economic growth of the Atlantic Area

Whereas supercritical fluid processes are well established in a few field of technology, such as agro-food industries, application in other field need to be stimulated. The network activities will:

- Allow strengthening the understanding of the Supercritical Fluid Technology from a scientific viewpoint;
- Contribute to the development of environmental technology, aimed at reducing the impact of human activities on the environment thus contributing to sustainable development;
- Provide a forward looking vision of Supercritical Fluid applications of the future and how these can be used to economic advantage of the Atlantic Area.

- To promote exchange of experiences and good practice between partners

The network activities will enable the movement of staff and students between the partners thus contributing to promote exchange of information and experiences among participants and contributing to closer communication between the different actors involved in Supercritical Fluid Technology.

- To provide training to students and companies in the Atlantic Area

The exchange of knowledge between different scientific and industrial communities will be promoted by organizing annual seminars. These seminars will provide training to students and industrial attendees.

- To disseminate results

The members will act as cohesive force to promote the activities of the SUPERMAT network within the Atlantic Area and the rest of Europe. A wide spectrum of dissemination routes, addressing academic, industrial and general public audiences will be used. Results will be published in the open literature, posted regularly on our specially designed web pages, and presented at major international and national conferences.

Web site: [www.univ-pau.fr/supermat](http://www.univ-pau.fr/supermat)

- To interact with others networks

In order to achieve maximum results, the SUPERMAT network will interact with others already existing and future networks in the field of supercritical fluids.

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