



European
Commission

This fiche is part of the wider roadmap for cross-cutting KETs activities

'Cross-cutting KETs' activities bring together and integrate different KETs and reflect the interdisciplinary nature of technological development. They have the potential to lead to unforeseen advances and new markets, and are important contributors to new technological components or products.

The complete roadmap for cross-cutting KETs activities can be downloaded from:

<http://ec.europa.eu/growth/industry/key-enabling-technologies/eu-actions/ro-ckets>

Potential areas of industrial interest relevant for cross-cutting KETs in the Chemical Processes, Chemicals, Chemical Products and Materials domain



This innovation field is part of the wider roadmap for cross-cutting KETs activities developed within the framework of the RO-cKETs study. The roadmap for cross-cutting KETs activities identifies the potential innovation fields of industrial interest relevant for cross-cutting KETs in a broad range of industrial sectors relevant for the European economy.

The roadmap has been developed starting from actual market needs and industrial challenges in a broad range of industrial sectors relevant for the European economy. The roadmapping activity has focused on exploring potential innovation areas in terms of products, processes or services with respect to which the cross-fertilization between KETs can provide an added value, taking into account the main market drivers for each of those innovation areas as well as the societal and economic context in which they locate.

Taking the demand side as a starting point, cross-cutting KETs activities will in general include activities closer to market and applications. The study focused on identifying potential innovation areas of industrial interest implying Technology Readiness Levels of between 4 and 8.

CH.3.7: Functionalized filter media for separation/purification/extraction/classification

Scope:

Higher performance functionalized filter media for liquids and gases for application in purification/separation/extraction/classification processes for use e.g. in chemical, pharmaceutical and biotechnological processes, as well as environmental treatment and water purification.

Demand-side requirements (stemming from Societal Challenges) addressed:

- Tackle the “climate action, resource efficiency and raw materials” challenge, indirectly also contributing to address challenges such as “smart, green and integrated transport” and “secure, clean and efficient energy”

Demand-side requirements (stemming from market needs) addressed:

- Increase resource-efficiency and reduce waste as well as emissions generation
- Improve process efficiency

Specific technical/industrial challenges (mainly resulting from gaps in technological capacities):

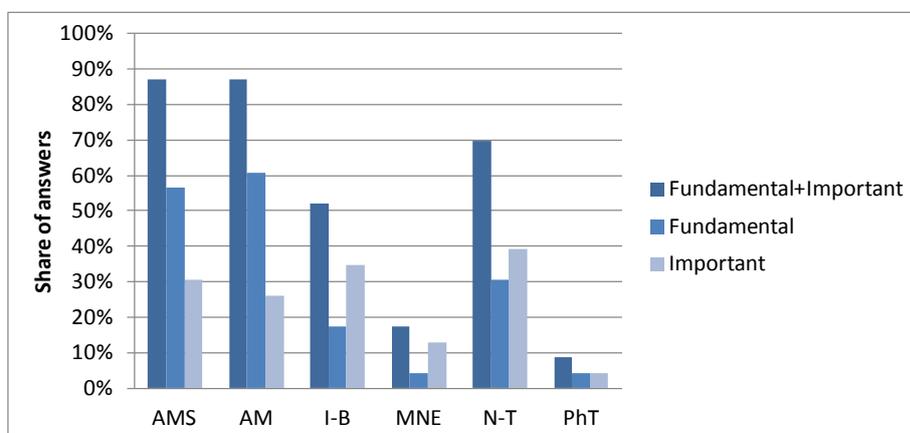
- Understanding of filter media microstructure and trans-medium transport to tailor filter media properties
- Evaluation, modelling and simulation of filter media properties and cake formation aimed at filter performance prediction in time
- Improvements in filtration equipment aimed at increased performance and reduced operating (including by reduced energy consumption) as well as maintenance costs (including by extending the lifetime of the filter media)

Contribution by cross-cutting Key Enabling Technologies:

In respect to this Innovation Field, the integration of KETs could contribute to the development of higher performance functionalized filter media for liquids and gases for application in purification/separation/extraction/classification processes thanks to the adaptation of materials, the tailoring of the filter media microstructure and trans-medium transport processes, and general improvements in filtration equipment aimed at increased performance and reduced operating (including by reduced energy consumption) as well as maintenance costs (including by extending the lifetime of the filter media).

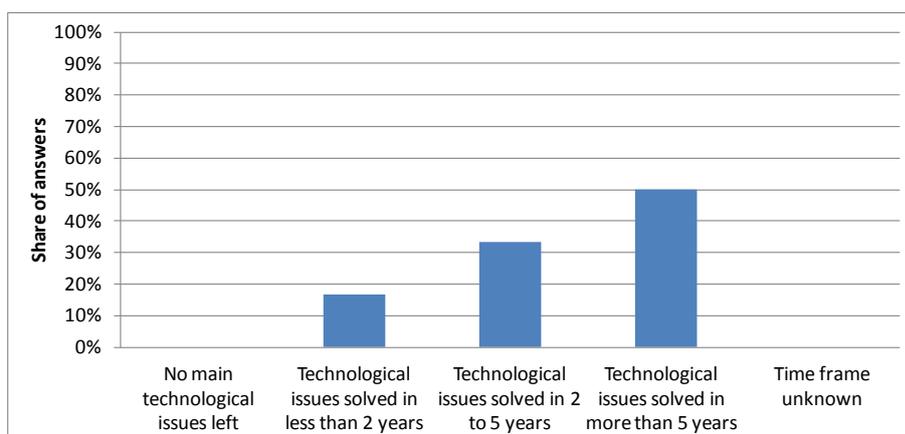
To this aim, the combination of KETs experts' opinions collected through the dedicated survey (whose result is depicted in the below bar chart), the examination of KETs-related patenting activity in respect to this Innovation Field, and desk research activities, have allowed identifying a rather strong interaction of KETs with respect to this Innovation Field, with either fundamental or important contribution mainly by the following KETs:

- Advanced Manufacturing Systems (AMS)
- Advanced Materials (AM)
- Nanotechnologies (N-T)



Timing for implementation:

According to the majority of KETs experts' opinions (whose result is depicted in the below bar chart), desk research, and in line with the KETs-related patenting activity in this field, it is considered that the main technological issues holding back the achievement of cross-cutting KETs based products related to this Innovation Field could be solved in a time frame of more than 5 years, yet significant consensus by experts indicates also shorter periods being necessary:



Hence, depending on the specific technical and/or industrial challenges holding back the achievement of cross-cutting KETs based products related to this Innovation Field, the provision of support in the short to medium term should be taken into consideration within this framework.

Additional information according to results of assessment:

➤ **Impact assessment:**

- Advanced filter media for separation, purification, extraction and classification include a number of membrane filtration technologies such as microfiltration, ultrafiltration, nanofiltration, reverse osmosis and ion exchange.
- Membrane filtration finds widespread applications in the pharmaceutical, biopharmaceutical and biotechnology industries as products of these industries and their intermediates are susceptible to degradation due to heat and chemical treatment, which makes it difficult to separate them using alternate technologies.
- Membrane filtration is widely used as a separation and purification technique especially in the pharmaceutical, biopharmaceutical and biotechnology industries. Its adoption rate in Europe and North America is very high and has an increasing trend that reflects the increasing growth trends of the end use sectors mentioned above. The increasing adoption rate in the Asia-Pacific segment and the increasing demand for single use technology are further driving market growth. As a result, the market is expected to witness high growth in the period to 2018. The global membrane filtration market was valued at 2.7 billion Euro in 2013 and is expected to reach 5.9 billion Euro by 2018, at a compound annual growth rate (CAGR) of 16.6%.

- In 2013, Europe was the largest market for membrane filtration. However, the North American market is expected to grow rapidly in the period between 2013 and 2018 and is expected to be as large as that of Europe by 2018. Besides important North American players, the major European players in the membrane filtration market for pharmaceutical and biotechnology are Sartorius Stedim Biotech (France), Alfa Laval (Sweden), GEA Group (Germany), and Novasep (France).
- Sources: Research and Markets, 2014, Global Pharmaceutical Membrane Filtration (Microfiltration, Ultra filtration, Nano filtration, Reverse Osmosis and Ion Exchange) Market Report 2014-2018; Markets and Markets, marketsandmarkets.com

➤ **Results of patents scenario analysis:**

- 4 exclusively KETs-related patents identified in the period 2001-2011 for the specific Innovation Field
- No significant patent-related indicators can be reported in this field