

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.1.1: Bio-based fine as well as specialty chemicals, bio-polymers and other bio-based derivatives

Scope:

Bio-based fine and specialty chemicals, bio-polymers, bio-lubricants, and other bio-based materials as well as derivatives produced starting from renewable resources, which may either be biodegradable/compostable or have properties that render them suitable for durable applications.

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:

- Provide for the replacement of fossil resources, thereby addressing security of supply for key market sectors

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

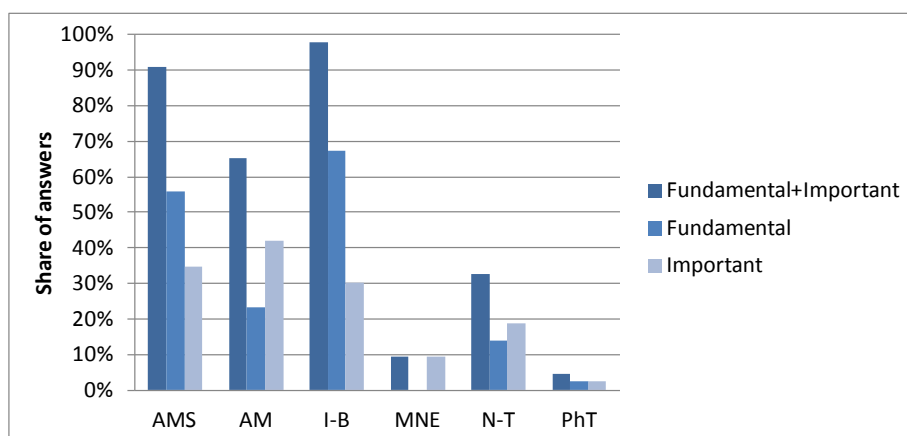
- Development of innovative formulations for biodegradable and compostable products aimed at widening the application potential of bio-based derivatives in non-durable goods
- Modification (e.g. by alloying and fortification with impact modifiers, reinforcing fillers, nano-additives, etc.) to overcome most bio-polymers’ inherent brittleness, low heat resistance, and processability limitations so as to widen their application potential particularly in durable goods

Contribution by cross-cutting Key Enabling Technologies:

In respect to this Innovation Field, the integration of KETs could contribute to the further development of innovative formulations for bio-based fine as well as specialty chemicals, bio-polymers and other bio-based derivatives aimed at widening the application potential of bio-based products. The integration of KETs could for instance contribute to the development of innovative formulations for bio-based materials to be applied in durable goods (besides in non-durable goods), especially by the modification (e.g. by alloying and fortification with impact modifiers, reinforcing fillers, nano-additives, etc.) to overcome most bio-polymers’ inherent brittleness, low heat resistance, and processability limitations.

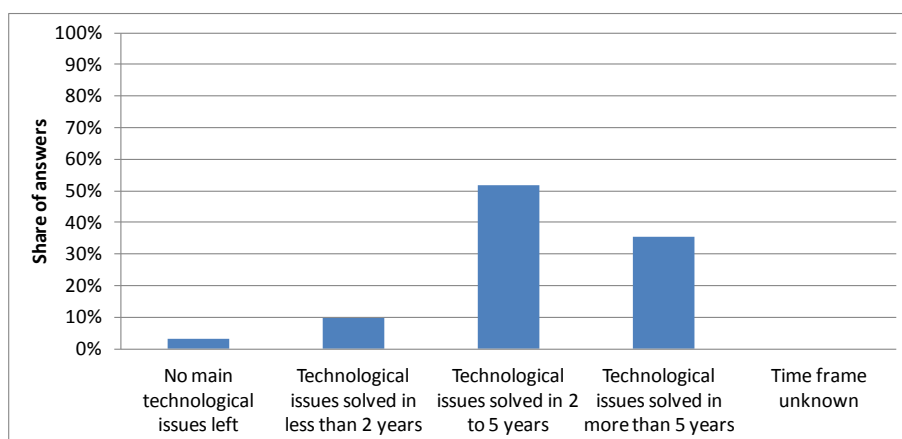
To this aim, the combination of KETs experts’ opinions collected through the dedicated survey (whose result is depicted in the below bar chart), the examination of KETs-related patenting activity in respect to this Innovation Field, and desk research activities, have allowed identifying a rather strong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

- Industrial Biotechnology (I-B)
- Advanced Manufacturing Systems (AMS)
- Advanced Materials (AM)



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 2 to 5 years, yet significant consensus by experts indicates also greater 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:

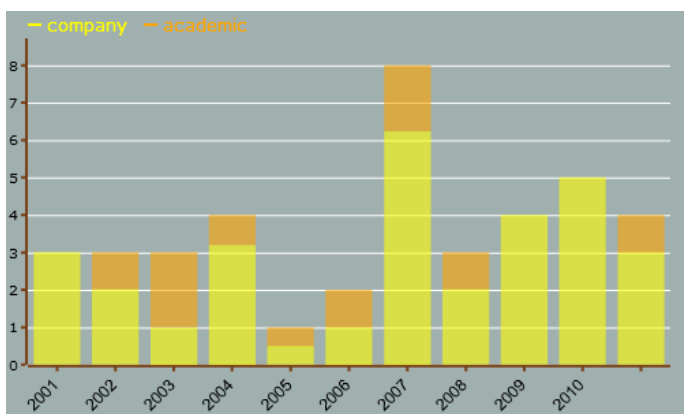
➤ Impact assessment:

- Several forces, including high oil prices, consumer preference, corporate commitment, and government mandates and support, are driving development in the area of bio-based chemicals and materials. As a result, the bio-based industry has reached a tipping point, with production expected to double in the upcoming years. Current developments (which include several investments being made in pilot production facilities) let assume that especially the bio-based chemicals sector will likely have a strong expansion in the next future. Platform chemicals obtained from renewable resources are expected to grow substantially over the next five years. This will open up perspectives for new applications for bio-based products including fine as well as specialty chemicals, bio-polymers and other bio-based derivatives and will also generate a strong boost for the cost effective production of biofuels within a biorefinery context (Source: International Energy Agency (IEA) Bioenergy, Bio-based Chemicals, Value Added Products from biorefineries, 2012).
- As stated within COM(2012) 60 final, the bioeconomy sectors in Europe are worth 2 trillion Euro in annual turnover and account for more than 22 million jobs and approximately 9% of the workforce. However, in order to remain competitive and maintain jobs in the light of major societal challenges and

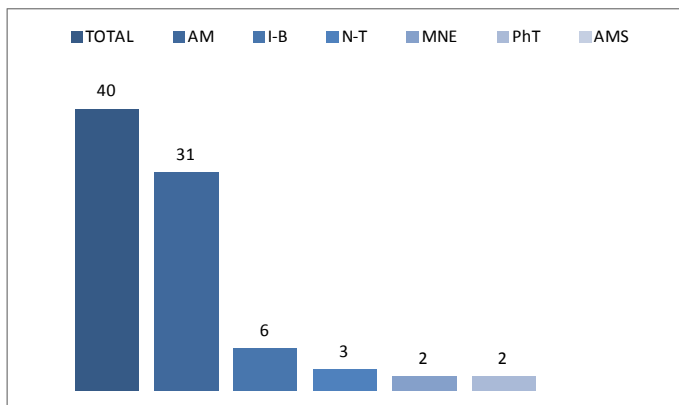
rising markets, the European bioeconomy sectors need to innovate and further diversify. Within this framework, it is estimated that direct funding for research and innovation associated to the Bioeconomy Strategy under Horizon 2020 could generate about 130 000 jobs and 45 billion Euro in value added in bioeconomy sectors by 2025. Further growth is expected from other – direct and indirect – public and private investments in all parts of the bioeconomy (Source: Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions titled 'Innovating for Sustainable Growth: A Bioeconomy for Europe' (COM(2012) 60 final)).

➤ **Results of patents scenario analysis:**

- 40 exclusively KETs-related patents identified in the period 2001-2011 for the specific Innovation Field
- Almost stable trend curve (number of patents per year) with a generally low patenting activity per year
- Highest share of industrial applicants with intermittent relevant patenting activity by academic applicants, most probably standing for new technologies having been patented in the corresponding periods:



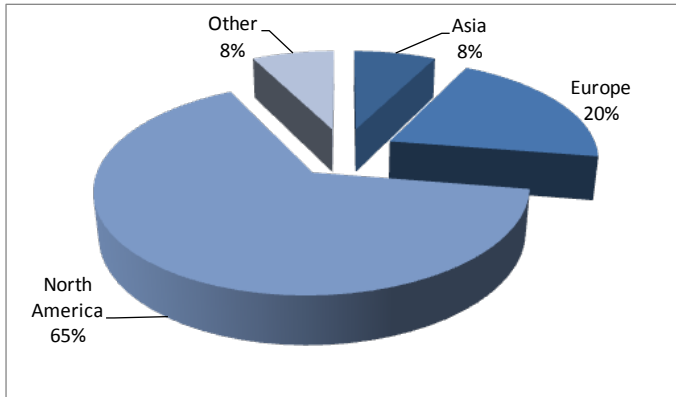
- Patents by KET(s):



- Patents by KET(s) and relevant combinations of KETs:

KET(s)	Number of patents
AM	31
AM / IBT	1
AM / N-T	1
IBT	6
MNE	2
MNE / PhT	1
N-T	3
N-T / PhT	1
PhT	2

- Patent distribution by (Applicant) organization geographical zone:



- Patent distribution by geographical zone of priority protection:

