European Commission

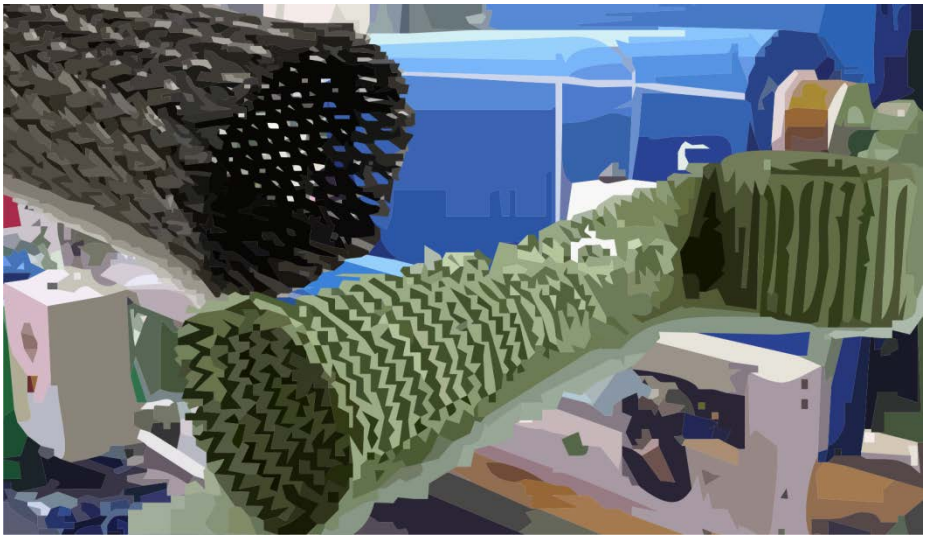
This fiche is part of the wider roadmap for cross-cutting KETs activities

'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 Textiles 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.

TX.1.2: Bio-based fibres with tailored properties

Scope:

To develop bio-based fibres with tailored properties intended for biomedical, textile and technical textile applications to move away from refined-oil based products.

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

Depending on the application or the type of feedstocks or processes used for production, textiles can contribute to tackle the following societal challenges:

- Health, demographic change and wellbeing
- Inclusive, innovative and secure societies
- Climate action, resource efficiency and raw materials
- Secure, clean and efficient energy

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

- Decrease dependency of chemical production from oil by shifting the feedstock base towards alternative feedstocks
- Improve environmental performance of products

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

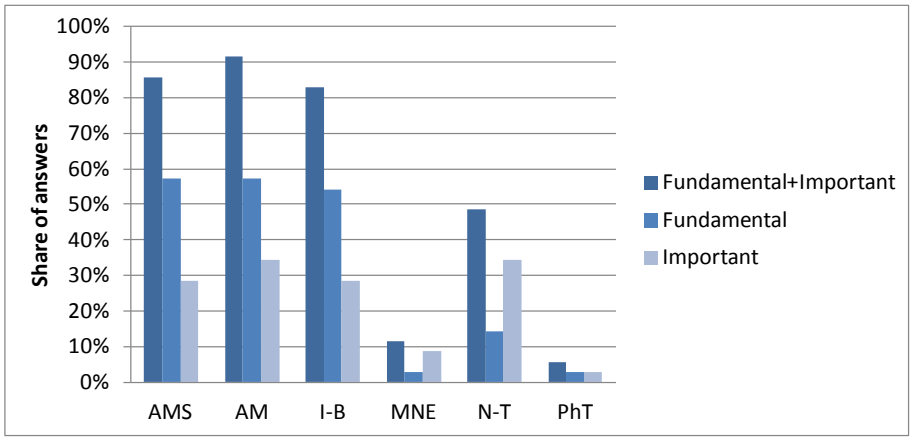
- Production of bio-based textile fibres with tailored properties to move away from refined-oil based products
- Development of improved machines allowing for the processing of these fibres
- Development of natural fibres with improved and tailored performances

Contribution by cross-cutting Key Enabling Technologies:

In respect to this Innovation Field, the integration of KETs could contribute to the development of bio-based fibres with tailored properties intended for biomedical and technical textile applications, reducing the dependency from fossil-based resources; results are expected to overcome most bio-polymers' limitations in regard to textile processing.

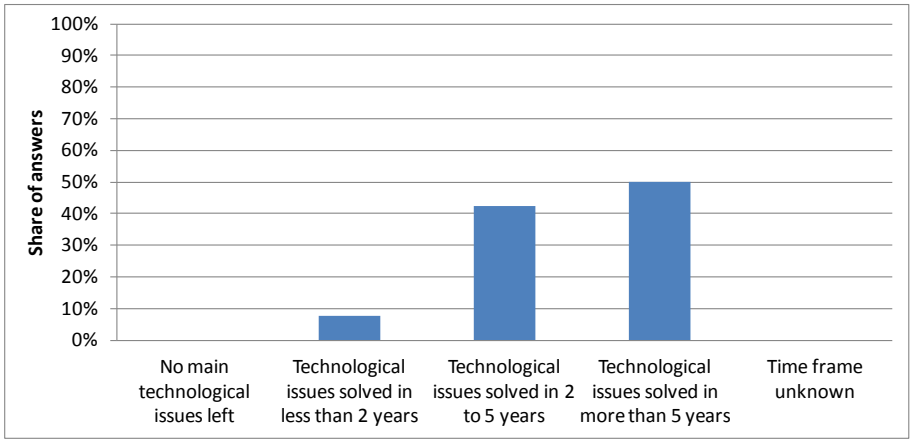
To this aim, the combination of KETs experts' opinions collected through the dedicated survey (whose result is depicted in the below bar chart), the examination of KETs-related patenting activity in respect to this Innovation Field, and desk research activities, have allowed identifying a rather strong 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)
- Industrial Biotechnology (I-B)
- 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:

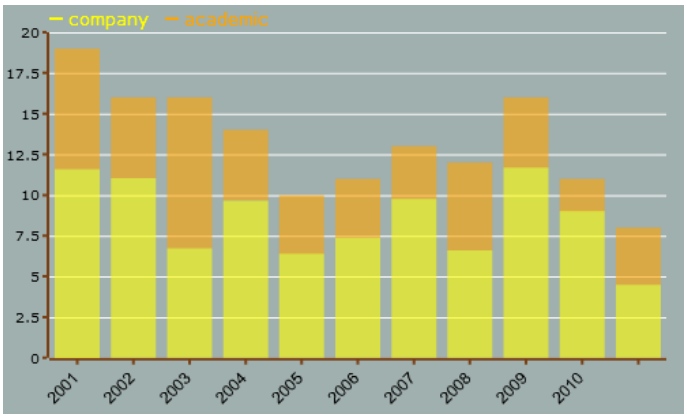
- ***Impact assessment:***
  - There are two opportunities for bio-based products to penetrate the textiles market. First, bio-based fibres derived from either agricultural crops or forestry waste can be processed and developed to replace or blend with existing natural fibres. On the other hand, bio-based chemicals can be used to manufacture polymeric materials that, depending on their characteristics, can be spun into fibre for use in textiles (Source: Bio Based Textiles, http://fibreroadmap.wikispaces.com).
  - Bio-based chemicals have the potential to be used for the manufacture of polyesters and nylons, which will probably occur as soon as bio-based chemicals that can be polymerized become available at competitive pricing.
  - On the natural fibre side, cellulose has been used for fibre manufacture for many years via simple chemical processing that produces Rayon®. Addition of carbon disulfide, altered the properties of the cellulose fibre so that it could be spun into filament, known as generically as the viscose process. Subsequently, a process where cellulose is treated with amine oxide has been used to produce a slightly different cellulosic fibre. This material is known as lyocell, and is manufactured by Lenzing under the tradename Tencel® using cellulosic material sourced mainly from beech wood, but flax, and hemp

fibres have also been utilized. The resulting textiles are known by a number of names, including polynosics, Modal, and Tencel. Other efforts in natural fibre utilization involve plant genetics, particularly for flax and hemp, in order to produce plant fibre that has properties more closely related to that of cotton (Source: Bio Based Textiles, http://fibreroadmap.wikispaces.com).

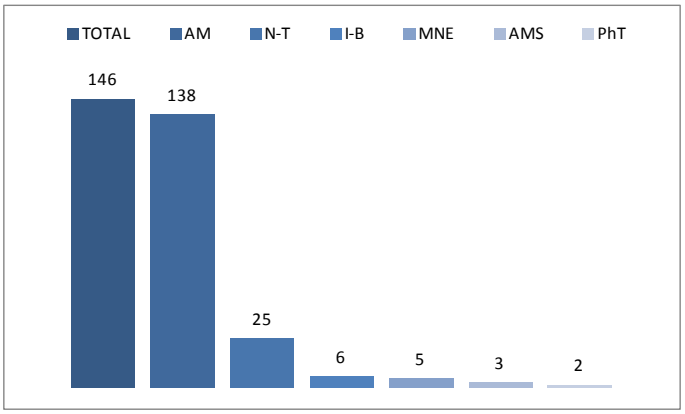
- As regards technical applications, in construction for example, the cost of natural fibres is 3-4 times higher than that of mineral wools but natural fibres have good mechanical properties (impact resistance, acoustic qualities, and strongly reduced weight). Benefits in cars are as well related to lightweight advantages over conventional glass fibre compounds and partly to cost advantages over PUR foam based products. Natural fibres also allow for better waste management: materials containing vegetable fibres are easier to recycle or burn than the materials containing fibreglass fibres (Source: Accelerating the Development of the Market for Bio-based Products in Europe, Report of the Taskforce on Bio-Based Products Composed in preparation of the Communication "A Lead Market Initiative for Europe").

➢ ***Results of patents scenario analysis:***

- 146 exclusively KETs-related patents identified in the period 2001-2011 for the specific Innovation Field
- Oscillating but almost stable trend curve (number of patents per year)
- Shared between industrial and academic applicants:



- Patents by KET:

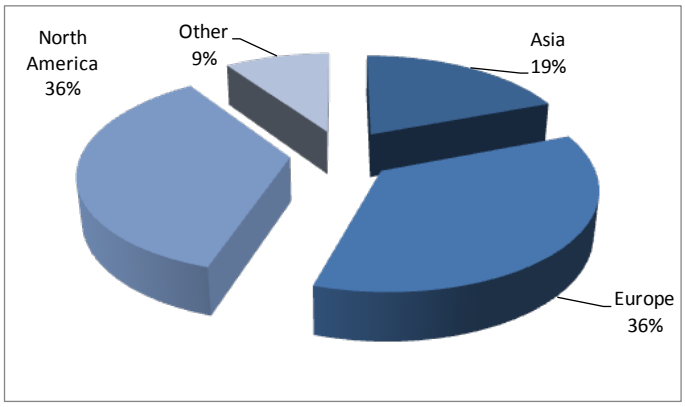


- Patents by KET(s) and relevant combinations of KETs:

KET(s)	*Number of patents*
AM	138
AM / IBT	4
AM / IBT / N-T	1
AM / MNE	3
AM / MNE / N-T	3
AM / N-T	20

KET(s)	*Number of patents*
AM / PhT	2
AMS	3
AMS / AM	2
AMS / AM / N-T	2
AMS / N-T	2
IBT	6
IBT / N-T	1
MNE	5
MNE / N-T	5
N-T	25
PhT	2

- Patent distribution by (Applicant) organization geographical zone:



- Patent distribution by geographical zone of priority protection: