EuCheMS
European Chemical Sciences

EuCheMS response to
Nanotechnologies, Advanced Materials, Biotechnology, and Advanced Manufacturing and Processing (NMBP) Stakeholder Consultation
https://ec.europa.eu/programmes/horizon2020/en/nmbp-work-programme-2018-2020-preparation

1. What are the challenges in the field concerned that require action under the Work Programme 2018 – 2020? And would they require an integrated approach across the societal challenges and leadership in enabling and industrial technologies?

Please help us establish strategic approaches with your answers to this question. The Work Programme topics will be developed from detailed industrial roadmaps in nine areas.

In the fields of *Nanotechnologies* and *Advanced Materials*, the main challenge is scale-up. For commercialisation of emerging technologies in these fields, which include quantum dot- and graphene- (and other two-dimensional material-) based technologies, a reliable method of synthesis is required, but many of the methods used in the laboratory are not easily scaled to commercial volumes. Once the materials can be scaled, scalability of the devices must be addressed. For example, in the area of solar cells fabricated from nanoparticle precursors, high power conversion efficiency can be demonstrated on small area devices, but scaling this technology to larger area devices remains a challenge.

In the area of *Nanotechnologies*, a further challenge relates to the lack of data relating to the safety of nanomaterials, leading to society's reluctance to adopt new technologies in this area. The uncertainty in the safety of nanomaterials has implications in industry (relating to the safety of workers), in consumer products (relating to safety of the consumer), and in healthcare, where nanomaterials offer great potential for diagnostic and therapeutic applications, but the uncertainty relating to their safety *in vivo* is stalling clinical development. Many existing studies into the safety of nanomaterials do not adequately consider the vast array of nanoparticles being developed. For example, many studies do not consider quantum dots, fluorescent nanoparticles on the order of 1 – 10 nm, with potential applications in diagnostic imaging. More targeted studies, focussing on specific types of nanomaterials, are required to fully understand the health and safety aspects of nanomaterials.

In the areas of *Nanotechnologies* and *Advanced Materials*, an additional challenge relates to the development of technologies compliant with the Restriction of Hazardous Substances (RoHS) Directive.[1] Research and development of nanoscale and functional materials is still heavily focussed on materials containing RoHS regulated heavy metals, such as cadmium, mercury and lead. For example, research into quantum dots for display and solar applications continues to utilise cadmium and lead chalcogenides, along with newer materials such as lead halide perovskites.

[1] 2002/95/EC

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2. What is the output/impact that could be foreseen? Which innovation aspects could reach market deployment within 5 – 7 years?

How could this benefit industrial leadership and the priorities of the Commission, notably the Digital Single Market and the Energy Union?

In addressing the above, potential output/impact is that technologies could reach the market sooner. Where these technologies offer improved energy efficiency or relate to renewable energy, this has the potential to reduce emissions and benefit the European Commission's priority of the Energy Union. In relation to biomedical technologies, this further offers the potential to improve patient care, including quality of life, and to reduce mortality.

There are a number of nanomaterial-based products currently on the market, including quantum dot display and lighting products. If the aforementioned challenges can be addressed, it is envisaged that the range of nanomaterial-based products available will increase over the next 5 – 7 years, to potentially include solar cells and biomedical products.

3. Which gaps (science and technology, innovation, markets, policy) and potential game changers, including the role of the public sector in accelerating changes, need to be taken into account?

There is a gap in the policy on nanomaterials (particularly relating to their health and safety), which needs to be developed before these materials can be exploited to their full potential.

4. Which areas could benefit from integration of horizontal aspects such as social sciences and humanities, responsible research and innovation, gender aspects, and climate and sustainable development?

n/a

5. How can the NMBP part address as effectively as possible the emerging supply chains, notably in the context of the 4th industrial revolution, in which the fusion of technologies is blurring the lines between the physical and digital spheres?

n/a

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About EuCheMS

EuCheMS, the European Association for Chemical and Molecular Sciences, aims to nurture a platform for scientific discussion and to provide a single, unbiased European voice on key policy issues in chemistry and related fields.

EuCheMS has been active since 1970, when it was created under the name of FECS (Federation of European Chemical Sciences). Representing more than 160,000 chemists from more than 40 Member Societies and other chemistry related organisations, EuCheMS relies on a unique network of active researchers involved in all the fields of chemistry. Through this network, EuCheMS organises several specialised academic conferences as well as the biannual EuCheMS Chemistry Congress, the European congress of chemical sciences. EuCheMS also promotes the role and image of the chemical sciences among the general public and policy-makers through social media, newsletters and through the organisation of conferences and workshops open to the society.

Through the promotion of chemistry and by providing expert and scientific advice, EuCheMS aims to take part in the solution to today´s major societal challenges.

EuCheMS is registered in the Transparency register.

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