

**ANALYSIS ON RESEARCH NEEDS.
INTRODUCTION TO A STRATEGIC
RESEARCH AGENDA FOR THE
EUROPEAN PLASTICS AND
COMPOSITES INDUSTRY**

by ECP4 (The European Composites, Plastics and
Polymer Processing Platform)

2016

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Acknowledgements:

The Analysis on Research Needs. Introduction to a Strategic Research Agenda for the European Plastics and Composites Industry 2016 has been developed and reviewed by ECP4 members and it includes the contribution of many SMEs involved as partners in European R&D projects under FP7 and H2020 Programmes.

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Introduction

The Strategic Research Agenda for the Plastics and Composites Industry is a plan to illustrate how European Industry and Research Organisations and the European Commission can work together to ensure we remain globally competitive, maintain our lead in technology and innovation, retain and grow investment and employment, fulfil Circular Economy objectives and meet societal challenges for a better tomorrow.

The Strategic Research Agenda has been developed with the following objectives:

- To clearly demonstrate the benefits of Plastics and Composites Research and Innovation for the European Union.
- To outline the future strategic research needs for the EU Plastics and Composites industries with proposals which meet the Commission's objectives and keep the EU Plastics and Composites industries at the forefront of innovation and globally competitive.
- To seek under Horizon 2020 greater recognition of the potential for Plastics and Composites research and innovation with substantially more relevant topics in Horizon 2020 Programme and approvals for funding.

Facts and Figures

- The European Plastics and Composites Industry includes plastic processors, raw material producers, plastics machinery manufacturers and recyclers.
- European plastics processors produce 45 million tonnes of semi finished and finished plastic products for a large number of industrial and commercial markets.
- There are 50,000 EU plastic processing companies, mostly SMEs, employing 1.6 million people and generating a turnover of over 300 bn euros a year. European SMEs provide 59% of manufacturing employment. The SME companies are vital to our industry.
- They create jobs, they pay taxes, they innovate but they do need a network like ECP4 to maximise their potential.
- The European Plastics industry has a multiplier effect of 2.4 in GDP and almost 3 in jobs. (Source: The European House Ambrosetti study, data for Italy, 2013). Through corporation tax and social security costs the Plastics industry contributes in 2014 around 27bn euros to EU public finance and welfare (Source: "Plastics the Facts 2015", Plastics Europe).

Plastics industry contributes

26.3bn euros
to EU public finance and welfare
each year.

turnover of over

300 bn euros
a year

There are

50,000 EU
plastic processing companies,
employing

1.6 million people

SMEs provide

59% of

manufacturing **employment**

Plastics Processors produce

45 million

tonnes
of plastic products

The European Composites, Plastics and Polymers Processing Platform ECP4

ECP4 is an industry driven collaboration that unites the top level European research institutions, regional plastics clusters, and EU level industrial organisations of plastics and composites converters.

ECP4 brings innovation partners together to identify opportunities for collaborative Research and Development which yields industrial innovation to improve competitiveness in the global economy and meet societal and environmental challenges.

ECP4 facilitates informal networking among innovation partners who frequently include SME companies, and makes use of the wide levels of scientific and engineering expertise to achieve objectives.

ECP4 facilitates the access of the European plastics industry to EU Research programmes, thus enabling SMEs to innovate, gain competitiveness, and fulfil sustainable goals.

ECP4 advises on new technologies and their relevance for the plastics converters and the composites industry.

ECP4 wishes to guide the European Commission on emerging opportunities in plastics and composites research and technology to increase competitiveness and meet societal challenges.

The Members of ECP4 are :

The European Research Institution members of ECP4 are a huge and valuable resource of world class status. All their staff total almost 8,000 full time employees, but 71% of the employees have a Science or Engineering degree.

ECP4 members have a huge range of research and innovation capabilities and specialisations and being strongly networked, they can draw on each others expertise.

These are just a very brief selection of their proven areas of skill:

- Development of new Polymeric, Composite, Nano and Bio materials.
- Smart industrial and energy systems.
- Advanced materials for energy systems, batteries, fuel cells.
- Material characterisation, development and processing.
- Advanced processing technology.
- Innovative surface technologies.
- Smart textile development.
- Applied Electrochemistry and Environmental engineering.

ECP4 members are currently active in supporting all industrial sectors where plastics and composites are used e.g.:

- Automotive, Healthcare, Defence ,Energy, Transport, Building and Construction, Aerospace, Space technology, Safety and Security, Biotechnology, Food, Packaging, Sport, Electrical and Electronic, Agriculture, Environmental protection.

Members of ECP4 with their broad range of capabilities are involved in different European Technology Platforms (ETPs) recognised by the European Commission, because the plastics and composites processing industries do not have a specific ETP.

RESEARCH ORGANISATIONS AND CLUSTERS



- 1 
- 2  KUNSTSTOFF
TECHNIK
STUTTART
- 3  **VALUECENTRE**
Innovate in polymerer
- 4 
- 5  **sirris**
driving industry by technology
- 6  **Flanders
PlasticVision**
a division of FISCH
- 7  **WMG**
Innovative Solutions
- 8 
- 18 
- 19 
- 20  **IK4 CIDETEC**
Research Alliance
- 21  **AIT**
Institiúid um Thaighde
ar Ábhair
Materials Research
Institute
Connect & Discover
- 22 **Lithuanian Plastic Cluster**

- 9  **Fraunhofer**
ICT
- 10  **piep**
Inovação em engenharia
de polímeros
- 11  **TCKT**
Transfercenter für Kunststofftechnik GmbH
- 12  **Tomas Bata University in Zlín**
Centre of Polymer Systems
- 13  **proplast**
PLASTICS INNOVATION POLE
- 14  **PEP**
CENTRE TECHNIQUE
DE LA PLASTURGIE
ET DES COMPOSITES
- 15  **RESCOLL**
Recherche et Développement
- 16  **AIMPLAS**
INSTITUTO TECNOLÓGICO
DE PLÁSTICO
- 17  **IK4 TEKNIKER**
Research Alliance

European Associations



European Composites and Polymer Processing industries SWOT Analysis

Strengths

- Contributes to a more Sustainable society by light weighting products and therefore increasing energy efficiency (e.g. replacing traditional heavy materials in cars and packaging).
- Contributes to the creation of renewable energy (e.g. wind turbine rotor blades, components in solar panels).
- Increases Food safety and reduces wastage with sealed plastic packaging.
- Aids Water conservation with durable piping, guttering, tanks and irrigation.
- Improves Healthcare with blood bags, heart valves, dialysis machines, wound dressings.
- Manufacture of plastic products uses far less energy than traditional materials.
- Experienced workforce and a high level of employment. High level of education.
- Our many SME companies give growth potential and employ many disabled workers.
- Leaders in technology and material experience.
- High level of private investment.
- Safe industry, environmentally conscious.
- Despite high environmental costs, able to be globally competitive.

Weaknesses

- The correlation of virgin plastic prices to oil prices means unpredictable feedstock costs.
- Access to financing on reasonable terms difficult for SME companies.
- Low level of EU investments in research and development.
- High number of companies, mainly SMEs means industry lacks a strong strategy and cooperation.
- The image of plastics on littering and alleged health issues.

Opportunities

- Numerous commercial opportunities.
- Helping to meet the Commission's societal challenges.
- Enables new processing technologies, eg. 3D Printing.

Threats

- Cost of compliance with legislation, particularly environmental and chemical.
- Public perception of polymers.
- Polymer raw material producers moving production outside Europe.



The Challenge for Europe

Improving Competitiveness

European industry is under tough competitive pressure from developed economies such as Japan, USA, China and India and other emerging economies. The Lisbon European Council recognised this in March 2000 and set the objective of making the EU “the most competitive and dynamic knowledge based economy in the world”. This admirable and still highly relevant objective has been obscured by the World financial crisis and Eurozone problems.

It is time to energise the achievement of this objective by supporting strongly highly motivated and competitive production sectors such as Plastics and Composites.

Competition based on production cost is not realistic. Efforts must focus on differentiation:

- High added value products, technologies and services.
- Continuous incorporation of knowledge and innovation.
- Meeting sustainable requirements societal and environmental.
- Efficient management of resources.

The above is key to keeping Plastics and Composites manufacture and manufacturing technology in Europe, which means we must maintain our technological lead.

Leading Technology and Innovation

The Lisbon Strategy set the EU an objective of devoting 3% of its Gross Domestic Product (GDP) to Research and Development activities by 2010. This was not reached. The EU28 devoted 2.01% of GDP to R&D in 2013. China devoted 1.98% to R&D in 2012.

China aims to spend 2.5% of their GDP on public research and development by 2020.

The Chinese Government has developed a regional centre specialising in strategic fields including plastics materials. In Japan the Government funds clusters to develop strategic research with universities.

A survey of Global Patent Filings in 2014 showed that 56,000 came from Germany, 176,000 from Japan, 240,000 from USA, 1.3 million from China (Source: “The Future is Open : 2015 State of Innovation” Thomson Reuters).

The EU has the potential to continue its strong lead in plastics and composites technology but pump priming support from the Commission is essential. Once manufacturing moves offshore from Europe the Research and Development follows.

Retaining and growing manufacturing investment and employment

Only by maintaining a clear technological lead in plastics and composites can the European Union retain and grow investment and employment in these industries. Investing 6-8% of turnover in SME companies is high but investment in research is not high enough due to lack of EU pump priming. Clusters and Platforms such as ECP4 are needed to get critical mass and avoid duplication

Environmental requirements

It is vital that Plastics is part of the Circular Economy keeping resources in use for as long as possible, extracting the maximum value from them whilst in use and recovering and regenerating products and materials at the end of their service life.

Used Plastics are a valuable resource. They are eminently mechanically recyclable and most plastics can be recycled about six times. At the end of their useful life their high calorific content can provide energy through Energy from Waste combustion, providing local communities with much needed heat and power from their own waste, saving fossil fuels. Used plastics should not be landfilled.

Recycling of Plastics in Europe is increasing exponentially and in 2012 plastics recycling and energy recovery reached 62%. 38% went to landfill but this has declined by 26% since 2006 whereas recycling has increased 40%. But landfilling is still a first option in many EU countries. 9.6 million tonnes of used plastics are landfilled every year.

The EU Commission has proposed significantly higher recycling targets for plastic packaging waste by 2020 and 2025. The impact assessment prepared for Plastic Recyclers Europe shows that 8 mt of Greenhouse Gas Emissions could be saved by 2020 with the new targets and 50,000 new direct jobs created in plastics recycling.

The challenge for the European Commission, the Plastics and Composites industry and ECP4 is to: find new markets and uses for plastics recyclate, bring down the cost of it with improved and innovative processing techniques and technology, improve collection systems and incentives, reduce the attractiveness of exporting waste, encourage green procurement by the public and private sectors.

The European Plastics Recycling industry has 30,000 employees in 1,000 companies with 3 million tonnes of installed capacity and a turnover of 2bn euros per annum. E.g. 481.000 tonnes of waste PVC was recycled across Europe in 2014. PVC recycling saves one million tonnes of CO₂ emissions annually. There is an under capacity in EU plastics recycling due to 50% of plastic waste being exported for recycling overseas.

Poor waste management and bad behaviour puts plastic litter in environment, like rivers and oceans. The Plastics and Composites Industry is keen to work with authorities to tackle the bad behaviour that causes it. Technology can help with marine and riverine collection devices.

The Plastics and Composite industries comply fully with REACH and other legislation, meeting safety and environmental requirements. We comply with all Waste Directives which apply to our materials for example: Packaging, WEEE, ELV, Building and Construction and Agricultural Waste.



The Vision and Priorities of ECP4

The Priorities for ECP4 members are :

Business

- Keep and grow plastics and composites manufacturing in Europe through high added value products and technology.
- Maintain Europe's lead in technology and innovation.
- Adding value through partnerships.
- Stimulate SME company growth.

Products

- Agility, flexibility for individualisation on an industrial scale.
- Design for recycling and new uses for recyclate taking a full life cycle into perspective.
- Meeting environmental regulations.

Factory

- Energy neutral production.
- Reliable simulation tools.
- Process waste and end of life management.
- Improved process and quality reliability.
- Reducing production steps and lowering costs
- Merging of technologies.
- Improve craftsmanship in application.
- Meeting environmental regulations.

Plastics and Composites will materialise tomorrow's sustainable future. Innovation in both is essential to face the upcoming global challenges by providing safe and engineered materials with specific properties, new lean and precise processing technologies and novel recycling pathways in order to capture the full value of material previously described as waste which is a valuable resource.

It is important that our materials are part of the Circular Economy extracting the maximum value from them while in use and recovering and regenerating products and materials at the end of service life.

The Plastics and Composites Industry needs to be a key player and innovator in strong supply chains instead of a mere supplier. Innovation and sustainable production should be the basic differentiation elements.

Our industry needs to change its productivity models in agility and flexibility for individualisation on an industrial scale to meet trends in personalisation of products. But also maintain high European standards of quality and process reliability.

The objective is to incorporate continuous innovation in products, processes, and services satisfying economic restraints and improving environmental benefits.

Environmental requirements, the Circular Economy and more restrictive legislation are permanent drivers demanding innovative solutions, which can also lead to business opportunities within and outside Europe:

- Eco friendly processes minimising resource inputs, energy efficient production, and reduction in water consumption.
- Responsible use of resources, reducing food waste.
- Responsible use of materials, increased use of recycle.
- Sustainable solutions for waste generated during production and at the end of products useful life.

To achieve our Vision requires :

- Full co-operation and involvement of European, National and Sectoral Industry Associations
- A vigorous programme of technology development.
- Provision to Plastics SMEs of a network of excellence and expertise and access to EU funding for innovative research projects.
- Increasing the knowledge of SMEs on how to secure through ECP4 EU project funding.
- Support for organisations like ECP4 to fulfil this programme.

This Strategic Research Agenda contains a strong call to the European Commission to strengthen efforts to invest sufficiently in research and development specifically targeted towards plastics converters, composite producers, machinery and tooling manufacturers and recyclers.



The Benefits of Plastics and Composites Research and Innovation

The considerable experience of ECP4 members' participation in FP7 and now Horizon 2020 clearly shows that a small amount of EU funding for innovation projects triggers a huge payback in terms of commercial and other success. It also leverages in substantial amounts of industrial funding and a huge commitment in working hours of highly skilled staff.

As will be seen below the involvement of SME companies is substantial in EU supported projects, with benefits for the projects and them.

ECP4 members over the last three years have on average secured EU support for 17% of their research and innovation projects. This percentage is falling as fewer plastics and composite topics are identified in H2020 calls. This Strategic Research Agenda aims to show that opportunities will be missed unless this is reversed.

Examples of commercial and other success from EU supported projects

WOODY

This project helped to exploit bio base resins and a new spin off was created.

BREAD4PLA

This project showed that Polylactic acid (PLA) can be synthesised from the waste products of bakeries to fabricate a 100% biodegradable film to be used for the packaging of bakery products.

BIOSTRUCT

The project helped to commercialise new bio-based composites as well as its components (fibres, additives, polymers). It furthermore developed new processing technologies for more economic processing.

POLYCOND

Development of conductive plastic composites for eco-friendly, cost effective products protected against electromagnetic interference and electrostatic discharge. In addition weight was reduced by at least 60% and production time reduced by 80%.

BIOSOURCE COMP

Design, manufacturing and characterization of composite polymers derived from biodegradable resources, for automotive applications.

TRUCKSAFE

Trucksafe is developing a fully automated cargo securing system for heavy goods vehicles to efficiently and cost effectively secure cargo in curtain sided and rigid trailers. New fabrics have been developed and tested to increase strength without increasing weight.

CODE

A scalable microwave system was developed for homogenous heating and curing for large polyester resin parts such as ship bodies. Curing time was reduced from days to minutes.

PEGASUS

Decreased lead times, reduced costs, improved manufacturing flexibility within the automotive industry through an Integrated Design and Engineering Environment. Novel energy absorbing foams were developed and nano pigments for moulding in colour.

TRANSCOND

The project produced a series of film and coating products and the associated manufacturing technology to replace conventional high volatile organic content and heavy metal filled formulations for the electrically conductive coatings market. SMEs are selling the new products worldwide.

FIRE-RESIST

During the project the fire performance of high performance polymer matrix composite materials for the transport sectors were improved.

Other EU supported projects which have led to commercial success and improved manufacturing include: Hyperdry, Eclipse, Shine, Natex, Espirit, Nanomaster, Polygraph, Phoenix, Hydrus, Drius and Osirys.

Half the above also benefitted from improved energy efficiency and material technology advances.

Pictures:
top - Trucksafe
bottom - Fire-Resist



Involvement of SME Companies in EU supported projects

In EU supported Plastics research and innovation projects the majority had SME company involvement. In fact ECP4 members state that well above 75% of industrial partners were SMEs.

In May this year ECP4 surveyed European SME companies who have been partners in EU supported research and innovation projects. The market sectors these companies were serving are: transport vehicles, aerospace, energy, agricultural, automotive, construction, leisure goods, medical, electronics, food, solar energy, metal detection and product inspection systems.

The reasons why SME companies became partners are primarily for internationalization and commercial benefits. But there are secondary benefits such as increased visibility and experience of new materials and technology.

Asked to rate whether the projects they were partners in were a commercial or other success, most said commercial success was the highest achievement, followed by improved materials technology, and then improved manufacturing techniques.

The SME companies were asked about the advantages of being a partner in EU supported research and innovation projects. These are direct quotes from their survey responses. Each one is from a different company:

“ Participation is quite a motivation for our personnel. Direct contact with end users and direct feedback on ideas. “

“ As EU funds meet part of the costs, we are able to work on research projects which we otherwise could not afford or dare to undertake .”

“ Access to quality research partners. An opportunity to work with novel materials unobtainable for an SME. “

“ Innovative technologies, new materials and new opportunities. “

“ Participation in an EU supported project ensures we are front runners in different types of tech-nical development. “

“ Funding for R. and D. collaboration with interesting companies in Europe. Knowledge of innovative technologies. “

“Able to develop new products and services in a collaborative way. Access to expertise across Europe. Networking ,business opportunities, training of staff, increase of knowledge base. “

“ Access to support from other project members with skill sets that we do not possess in house. Learning to work within a consortium ,rather than a small team, and adopt sympathetic working practices to ensure project work is developed as fast as possible.”

The above comments speak for themselves on the huge benefits for SME companies, their staff and business in being a partner in EU supported plastics and composites projects.

The companies were also asked about what disadvantages they found. These were few but some spoke of poor communications. Some found the huge amount of paperwork a burden although the others felt the EU's administration requirements were reasonable.

This survey shows the huge value that SME companies have derived from EU supported projects. The experience has and is helping them develop as organisations and meet needs with new advanced products. It stimulates investment and employment. But all of this is greatly dependant on pump priming EU support continuing for plastics and composites research and innovation projects.



Societal Challenges met by EU supported Plastics projects

Plastics and Composites already make a substantial worldwide contribution to meeting growing societal challenges.

A few Examples are :

- Energy - wave power booms, wind turbine rotors, solar energy, insulation materials
- Green Transport - lightweight materials saving fuel in vehicles, aircraft, trains and trams
- Healthcare - syringes, heart valves, wound dressings
- Food Security - packaging preventing food waste, polytunnels in agriculture to resist disease, pipe systems for irrigation and water retention.

Looking at EU supported projects undertaken by ECP4 members over the last few years, many met societal challenges as outlined by the Commission.

- Healthcare
- Energy and Climate Control
- Green Transport
- Resource Efficiency

In order to support European SMEs EU rules on quality, health and the environment should be strengthened on Imports.

With Europe's ageing population requiring a greater commitment to and more innovation in healthcare and the explosion in the global population these challenges are going to increase and it is vital that the European Commission supports research programmes to find the answers to problems which are growing daily.

Strategic Research Needs for the Plastic and Composite Industries

President of the Commission Mr Juncker has written the following on the EU Research and Innovation Programme:

“ Focus more on applied research with a greater participation of the private sector and a special focus on SMEs, in particular Horizon 2020 with a view to reinforcing our industrial leadership and our capacity to address societal challenges “
(November 2014)

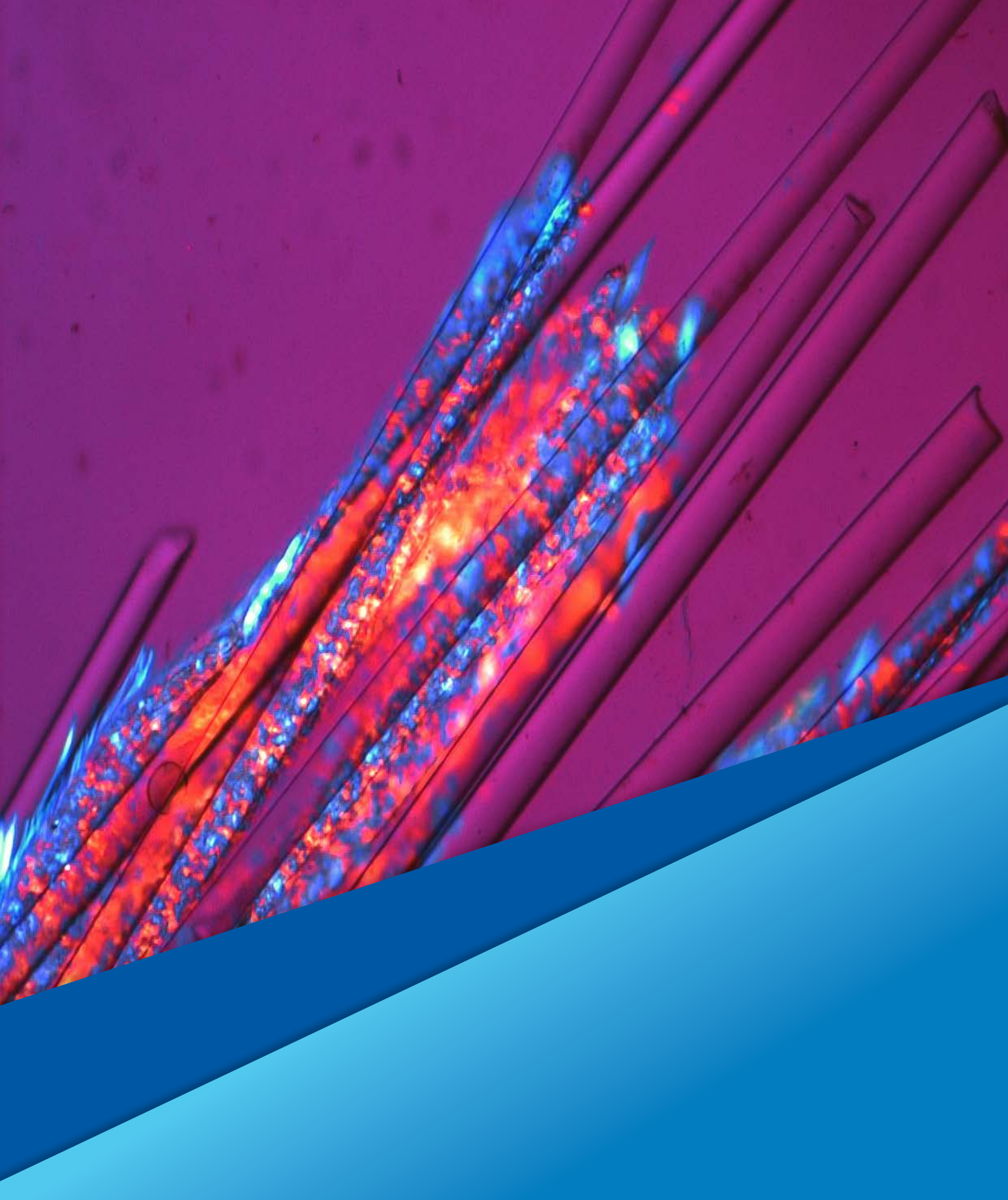
ECP4 agrees with the Commission President that it is essential that Horizon 2020 programmes reinforce Europe's industrial leadership. The Research Commissioner Mr Moedas has said he wants the research programmes to contribute to “jobs, growth and innovation”.

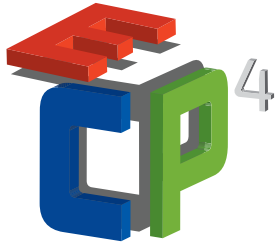
We are concerned however at the substantial drop in approvals for funding and the lack of plastics topics in Horizon 2020. On SME Instrument Phase 1 (March 15 cut off) out of 1,569 proposals received funding approval was only given to 151 (9.6% success rate). Horizon 2020 in 2014 had 34,000 proposals submitted in the opening stages with over subscription running at 8 times budget.

This brochure aims to introduce a broader study carried out by ECP4 members and that led into Strategic Research Agenda for the European Plastics and Composites Industry 2016.

The full report consists of the following chapters and it will be available for free consultation in the first quarter of 2016.

- **Proposals for Plastics and Composites Research which provide new competitive opportunities.**
- **Proposals which meet the Commission's big Societal Challenges.**
- **Proposals to meet future challenges in the next calls of Horizon 2020.**
- **Key Market Sectors for Plastics and Composites.**
 - **Automotive Sector and Aerospace**
 - **Packaging Sector**
 - **Electrical and Energy**
 - **Industrial Equipment**
 - **Medical**
 - **Construction**
 - **Agriculture**
 - **Renewable Energy**
 - **Textiles**
 - **3D Printing**





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