

4.1 Final publishable summary report

Organic and large area electronics is one of the most promising fields of electronic technologies. There is a huge market potential in Printed Electronics (i.e. organic, inorganic and composites) (Source IDTechEx, 2007): 2007: \$1.18 Bln, 2017: \$48.18 Bln, 2027: \$330.3 Bln.

Europe is well-positioned in organic and large area printed electronics (OLAE), because of the presence of leading device makers (SME's and large enterprises) as well as material and equipment suppliers and relevant research institutes in Europe. There is however a strong competition from Asia and USA in the field of OLAE. To keep technology leadership in Europe and turn this into market and production leadership, the activities in the European organic and large area electronics scene should be streamlined; cooperation and coordination is vital for competitiveness of European R&D. The EU FP7 Project PolyMAP is closely aligned with other EU FP7 projects: OPERA, PRODI and PolyNET; the four forming the "Quadrige" which will help Europe to advance in organic electronics. Main goal for Quadrige is coordination of the common goals; like roadmapping activities, SME-support, Mapping of Organic Electronics resources and Strengthening networks.

The PolyMAP project is run by 5 partners from 4 different European countries: Netherlands Organisation for Applied Scientific Research (TNO, The Netherlands), Fraunhofer Gesellschaft Zur Förderung der angewandten Forschung e.V. – Einrichtung für Modulare Festkörper Technologien (Fraunhofer EMFT, Germany), Commissariat à l'Energie Atomique Liten (CEA Liten, France), Teknologian Tutkimuskeskus VTT (VTT, Finland), Plastics Electronics Foundation (PEF, The Netherlands). The overall objective (aim) of PolyMAP is to strengthen the position of Europe as the leading force in Organic Electronics Worldwide. To reach this objective PolyMAP has undertaken three main actions:

Action 1: Mapping of public funding in Organic Electronics and setting-up an ERA-NET

Action 2: Set up an open source database for the field of OLAE

Action 3: Supporting European SME's essential in Organic Electronics Research and Industry

Action 1 resulted in a detailed inventory of national OLAE activities in Europe and contact information of the main players, funding agencies. The information was used in setting-up an ERA-NET+, led by the UK (Greg May and Peter Bachelor). A number of NFA's led by Greg May & Peter Bachelor (BERR) is now actively working on coordination of Nationally funded research in OLAE (ERANET+). The report on national OLAE activities can be requested by sending an e-mail to: herman.shoo@tno.nl.

On action 2 a database was created with an "open-site" approach, such as in "Wikipedia", for interactively gathering information and compiling an information source regarding the history and state-of-the-art of materials, devices and processes in organic electronics. The database can be found at <http://www.oe-a-wiki.org> and contains most update information and news items on OLAE in categories like: materials, processing, manufacturing, equipment, metrology, standards and applications. The transfer of the website and corresponding information database to the oe-a (Organic Electronics Association) was implemented to guarantee the continuation and public use of the website and the information database after the end of the PolyMAP project.

Action 3 on SME-support has gathered momentum via workshops to assist SME's, both on technical and financial issues and a support guide was published to help SME's to enter OLAE: Promoting entrepreneurship in organic and large area electronics in Europe. This report intends to help SME's in making the right choices when entering or expanding their activities in the field of OLAE is considered. Part of this is in the identification and analysis of SME business development needs and challenges. Furthermore, the findings laid the foundation for practical field world, which evolved around the themes of entrepreneur training and monitoring, and funding. This report can be found through the following link [Report Entrepreneurship](#) or through a link on the oe-a-wikisite.

A summary description of project context and objectives

Project context and objectives

Due to the huge market potential of organic electronics in the coming decades, it is important for Europe to have a leading role in this area. The EU FP7 Project PolyMAP intended to strengthen the position of Europe as the leading force in organic and large area electronics (OLAE) worldwide.

This prime objective is complemented and served by operational objectives: Mapping public funding in OLAE and setting up an ERA-NET Plus.

Following to an analysis of public funding in national and regional programs throughout Europe, collaboration and integration of the national research communities in organic and large area electronics (OLAE) throughout the ERA (European Research Area) will be stimulated, and thus overcome the fragmentation of research along national or regional lines. The ultimate goal is to organize the field either in an ERA-NET Plus or a similar approach.

This objective will be reached by the following actions: mapping the national / regional public funding in Europe, analysing the opportunities for trans-national cooperations and round tables on the ERA-NET with relevant partners.

Mapping and initiating an ERA-NET for OLAE (WP1)

To reach these objectives the PolyMAP project members have had contact with national funding agencies and main stakeholders in the field of OLAE. With these parties the preferred way to coordinate activities in a joint European call (e.g. ERA-NET+) were discussed, as well as suitable topics for such a call.

PolyMAP has completed a mapping of National Public Funding in the field of OLAE. This mapping has been used to investigate the possibility to line up national and regional programs on a European level. A complicating factor in this is the fact that the majority of National Funding for OLAE is not in specific calls, but is allocated within more general topics, such as “New Materials“, “Nanomaterials“, “High Tech Equipment“, etc. From the mapping it became clear that most countries in the European Union offer National Funding Schemes for OLAE activities. An overview of the activities per country is available, together with information on project officers and main national stakeholders. The estimate of the (National) budgets available on the European Research Area is in the range of 300-500 M€. Currently however, a large part of National/Regional programs related to OLAE have a rather broad scope, and consequently show a lot of overlap. Also, a substantial part of this is spent apparently on trying to catch up with the state-of-the-art. A general outcome of this mapping activity (supported by the OLAE community) is that a better coordination of these activities, in combination with a shared research roadmap would lead to a much bigger footprint of the European OLAE efforts, thus positioning European stakeholders much better on a global scale.

In order to gain sufficient critical mass for a joint trans-national call, e.g. an ERA-NET+, the main stakeholders in the field of OLAE and the national funding bodies were mobilized.

The main stakeholders were asked to confirm their support for an ERA-NET initiative in the field of OLAE by signing a support letter. Almost 60 support letters have been signed by various organizations, including universities, research institutes, OLAE competence centers, companies and even national funding bodies.

The PolyMAP team has organised discussions between the national funding organizations -in close cooperation with the European Commission Program Officers- to determine what would be the preferred way to coordinate a common approach to OLAE. Several national funding bodies have expressed their willingness to participate in setting up a joint European call for OLAE.

Open-site OLAE database creation (WP2)

The organic electronics industry is still in its infancy. This makes road-mapping for this particular field quite difficult due to the lack of a reliable track record of past results. Therefore, in order to support the present and future road-mapping activities, parallel to the activities aiming at realization of trans-national cooperation, the feasibility of an open-site information database for OLAE was investigated. Objectives for this work package were: evaluation of open-site options, setting-up and implementation of the database, creation of a moderator network for review and supply of database content, continuation of the database after the project.

After a thorough evaluation of the possibilities for gathering and collecting information and the best way to organize and display the content and after discussions with a number of separate stakeholders and with members of the board of OE-A (Organic Electronics Association) it has been decided to setup a dedicated open-site information database using an open-source content management system for websites. Chosen is a webbased service that would allow for formatting and reviewing of the data by a forum of reviewers/moderators (a completely open Wikipedia type approach would not be sufficiently reliable).

Through an “open-site” approach, such as in “wikipedia”, a database will be created for interactively gathering information and compiling an information source regarding materials, devices and testing in organic electronics. The database will be a collection of news on materials, processing, equipment, measuring, testing and applications. Content articles are created in collaboration with the Quadriga (PolyNET, OPERA and PRODI) as well as the OE-A roadmapping workgroups. The information database is making use of moderators who review articles to ensure the quality and reliability of the information. The open-site information database provides additional and networking functionalities that increase value for the users, such as relevant news items on the site, a newsletter, personal profile pages, members listing, focus groups and a discussion forum. A key differentiator to other similar initiatives has been developed and integrated in the website enabling interactive tables and automated graphing. Through the OE-A continuation is ensured through content creation, moderator involvement and administrator rights.

Supporting SMEs (WP3)

SMEs are essential in the European research and industry area. The objective in this workpackage is to help establish structures that actively support existing SMEs and start-ups and will improve the global competitive positioning of SMEs in relevant technologies.

In WP3 support is offered to SMEs, in close coordination with the OPERA-project. An analysis of SME's specific needs is made and a service and consultancy package is prepared and these services are proposed to SMEs.

An overview of the key challenges and support needs of startups and small and medium-sized enterprises (SMEs) operating in the field of organic and large area electronics (OLAE) was made. The approach was using different methods (questionnaires) of data acquisition and analysis and this provided input for an overview of the respondent companies in terms of their position in the OLAE value chain, orientation towards the applications market, and technology base. The main results of the study, identified challenges and support needs, are reported.

Based on this inventory a couple of dedicated consultancy/service workshops were organised for the European SMEs in the field of OLAE. From all discussions and feedback on events the OPERA team has made some key recommendations for the SME's, industry consortia and research institutes, government but also for European OLAE clusters on how to get involved in OLAE development or organize start-ups and how to promote and fund this.

Description of the main S&T results/foregrounds

WP1: Mapping and initiating an ERA-NET for OLAE

Several representatives of national funding agencies have been interviewed. Next to this there have been extensive discussions with project officers from different countries.

Almost all NFAs showed interest to take part in an ERA-NET; however national ministries have to be convinced. Especially for the larger countries the benefit of starting a European approach compared to national funding strategies is not obvious, since often a value chain can be covered within this country. Most important is therefore the commitment of industry that transnational approach to joined research and development is necessary. Especially for companies active in different EC member states this may be an attractive instrument. PolyMAP has explored the industrial interest by bringing the ERA-NET approach closer to company representatives and requesting them for documenting their request in the form of support letters. EMFT has concentrated for this on addressing major players in Germany in Austria. CEA Liten has concentrated on major players in France, Spain, Italy and Portugal. VTT contacted Finnish, Swedish and Estonian players. Holst contacted the Dutch, UK and Belgian players.

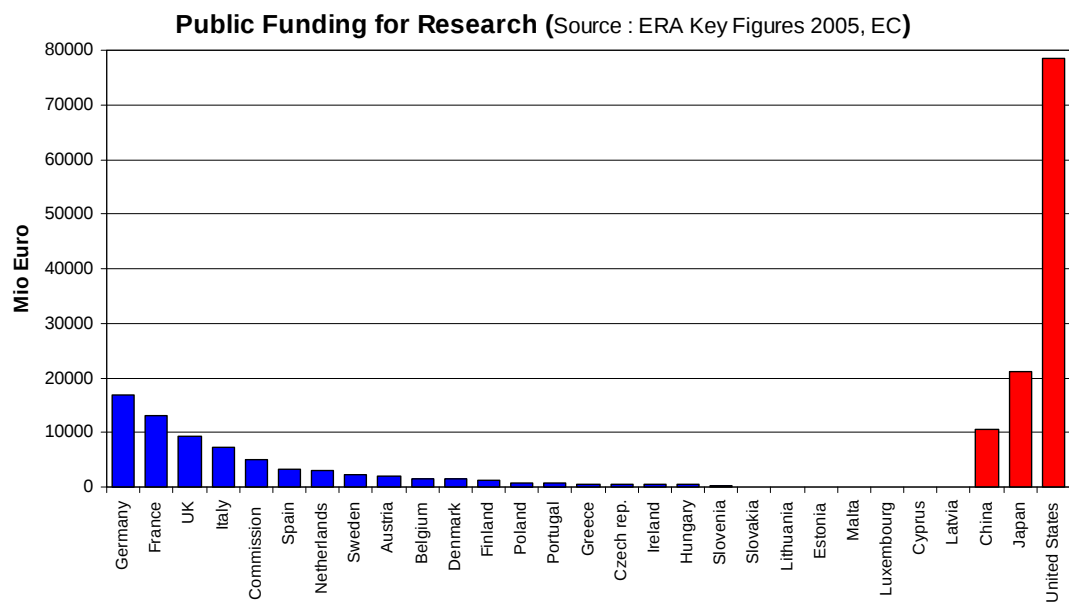
Regarding possible ERA-NET in OLAE it was observed that the topic should be broad enough to address enough partners, even from smaller member states, but also specific to ensure overlap of interests. Possible are preparatory as well as advanced research fields in pre-competitive areas.

Explicitly mentioned have been

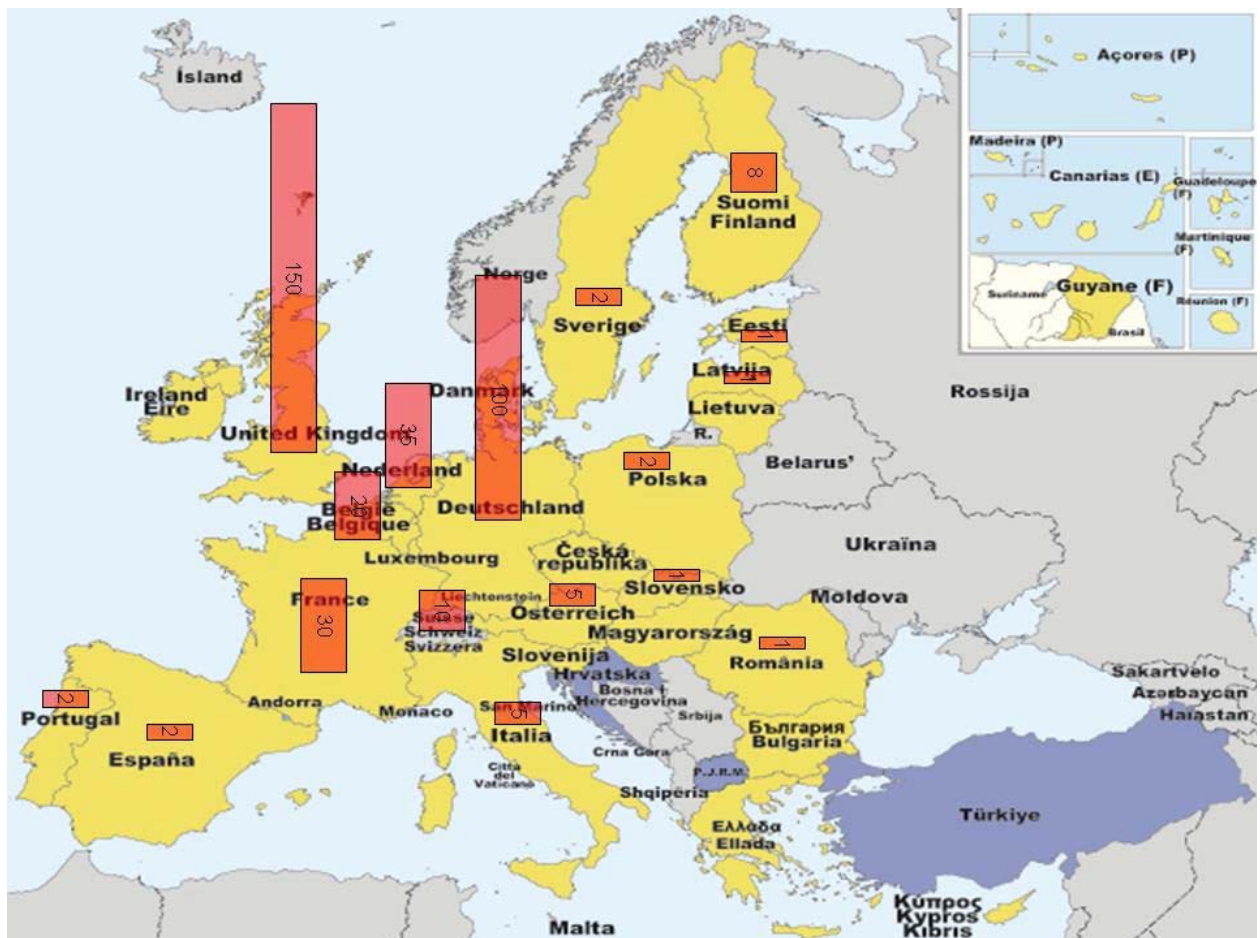
- new high performance materials for functional coatings
- applications with a complete value chain
- sustainable green organic electronics

The funding situation in Eastern Europe is quite different from the technological leading countries in Western Europe. The funding policy there is aligned to support locally emerging industries and foster the growth in low-income economies. Therefore, the not extensive funds are spent to foster R&D in the field of mainstream electronics, like PCB manufacturing or packaging technology and not in an emerging technology like organic electronics. For this there is a gap between the different needs for supporting research and development and there is only limited willingness to step into the OLAE area.

The mapping of public funding in Europe revealed that most countries in the European Union have national funding schemes in place for OLAE activities and that the total budget available is in the range of 300-500 M€. However, a large part of the national/regional programs related to OLAE appeared to have a rather broad scope and shows quite some overlap with other programs. Moreover, it seemed that a substantial part of the efforts within the projects is spent on trying to catch up with the state-of-the-art. A general feeling within the OLAE community is that a better coordination of these activities, in combination with a shared research roadmap would lead to a much bigger footprint of the European OLAE efforts and a much stronger position of the European stakeholders on a global scale.



Scattering in European activities and public Funding for Research



Mapping of national funding (in M€) for OLAE related research activities

Towards trans-national cooperation in the field of OLAE

One of the tools that is available for coordination of national/regional programs on a European level is the so called ERANET or ERANET+ scheme. An ERANET consists of a consortium of national funding bodies who organize a joint trans-national call in a research area which is deemed important for the national research policy. In order to gain sufficient critical mass for an ERANET, the PolyMAP team set out to mobilize the main stakeholders in the field of OLAE and the national funding bodies.

The main stakeholders were asked to testify their support for an ERANET initiative in the field of OLAE by signing a support letter. The support letter was distributed at the Quadriga booth at the LOPE-C 2009 and sent by e-mail to the list of stakeholders identified during the mapping phase. In France the support letter was translated into French and sent along with a French translation of the Strategic Research Agenda, which was compiled by the OPERA team, to the main stakeholders. 59 Support letters were signed by various organizations, including universities, research institutes, OLAE competence centers, companies and even national funding bodies. Several national funding bodies were approached by the project partners directly to discuss the possibilities of trans-national cooperation. The funding bodies from other EU member states were informed about the ERANET initiative via the mirror group of the Photonics21 Unit, in which the EC funding for all OLAE activities is embedded (since 2009). Funding bodies from different member states expressed their willingness to participate in setting up a joint European call for OLAE and are discussing and starting this together.

The general results for this workpackage:

- Few questionnaires were returned.
- In total 59 support letters from industry and universities for supporting the ERA-NET initiative were signed.
- OLAE activities/projects are scattered through a large number of different national programs.
- Predominantly open call programs harbor OLAE activities.
- Little to no programs are identified with primarily OLAE content.
- Search databases of funding agencies lack the easy-of-use for this kind of information gathering (the EPSRC database in the UK is an exception).
- Main value of simple internet search is the identification of stakeholders in particular all sorts of universities, university institutes and university centers but also “commercial” institutes/centers involved in OLAE.
- Regional funding is virtually impossible to get information on. Only through the internet search occasionally institutes and centers acknowledge regional funding agencies. Reason could be that regional funding agencies act mainly reactive on the demand from regionally active entities to promote regional development of industry and, thus, job creation. Regional agencies act on phone calls and questionnaires in a similar fashion as national funding agencies, but also often lack databases on projects.
- An ERA-NET+ for OLAE has started.

WP2: Open source database

To be able to assure content quality and information reliability the PolyMAP information database makes use of moderators, i.e., experts in the OLAE field. To build a moderator base PolyMAP approached people in the OLAE field which have already an established name. The moderators were asked to “push” their own subject and field of expertise, thus to approach people to contribute.

There will be four different visitors with different degrees of freedom to set the accessibility of the open-site information database on-demand:

Reader: every visitor is allowed to view the content in the information database

Contributor: a registered visitor of the PolyMAP information database site is allowed to write new articles and edit existing articles

Moderator: an appointed expert who monitors the quality and reliability of the information that is introduced in the information database and who can take action if this is not the case by restoring older versions of the article or notifying the contributor to modify his/her contribution. A moderator has additional privileges, e.g., to write news items.

Administrator: someone who overlooks the functioning of the open-site, take care of abuse, add functionalities, assist moderators, thus, in general keep the information database website operational.

In summary, the information database will be open to everyone to read and registered visitors will be able to contribute, while moderators will oversee the information quality.

This approach keeps the threshold for visitors to contribute as low as possible and at the same time enable the assurance of a high level of content quality and information reliability. In addition, registered people that contribute can automatically be acknowledged for their contributions, which is believed to be of great importance and value for the type of contributors expected to become active in the PolyMAP information database.

The type of information envisioned in the PolyMAP information database can be summarized as:

- materials characteristics
- benchmarking, performance : history, limitations
- standardization
- photobook, history and state-of-the-art
- common terminology
- device descriptions, process descriptions
- applications

The information database is organized in two parts. The main part is the actual content organized in sections, categories and content articles. The second part is put in place to promote, assist and support the content creation, as well as providing added value features to increase the value of the PolyMAP information database for visitors and persuade them to actual contribute. Since visitors have to register in order to contribute a community of users is created. Each member of the community will have a personal page where they can leave personal, company and/or product information. Members are also able to create subject groups, or 'expert' groups, which are groups that have expertise in the subject area. A moderator will be the group president. And furthermore a discussion forum (per group) will be made available for discussions on content items and other discussions related to the group.

oe-a-wiki

Flexible, Organic & Large-area Electronics information database wiki

supported by
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PolyMAP in transfer to oe-a-wiki.org

PolyMAP will be transferred in the care of the oe-a.
This means that the name PolyMAP will gradually disappear and all activities will be continued under the name oe-a-wiki @ oe-a-wiki.org.

Progress report @ next OE-A meeting

PolyMAP will present the latest developments and progress at the next OE-A meeting on the 16th and 17th of November in Oberschleißheim / Munich.

Last Updated on Friday, 08 October 2010 14:11

First PolyMAP moderators

PolyMAP has the pleasure to announce the first PolyMAP moderators. The moderators are asked to follow and promote the activities in their expertise area within the information database. [Register](#) now and see who the moderators are.

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WP3: Supporting SMEs

The progress on this combined work package is reported in both the PolyMAP and the OPERA Project. Promoting OLAE entrepreneurship in Europe is needed because the relatively immature state of OLAE materials, products and processes makes it difficult for SME's to finance revenue creating start-ups. Next to this Europe lacks large production companies that could generate the much needed market pull for OLAE technologies.

This work package and the WP4 of OPERA were devised to explore alternative ways of promoting entrepreneurship and developing the competitiveness of European start-ups and SME operating in different fields of OLAE. First the identification and analysis of SME business development needs and challenges was investigated. The findings laid the foundation for practical field work, which revolved around the themes of entrepreneur training and mentoring, and funding.

Three OLAE entrepreneur training events were organized as part of the project; two took place in Finland, one in Germany. Next to this there were two funding-related events. A venture forum to facilitate SME access to venture capital was organized in Belgium. A finance and investment roundtable to explore the underlying reasons for and possible solutions to scarce seed and early stage funding was held later in Germany.

Most participants regarded the events as useful, but a healthy and dynamic European business ecosystem in OLAE is prerequisite for the development of small enterprises in the field.

Four key recommendations were made:

For entrepreneurs in OLAE

Pay special attention to the development of the product concept and the identification of pilot customers. The product concept is a tool for incorporating the key characteristics of the offering, the underlying technologies, the co-operative arrangements needed to develop, produce and market the offering, and the envisaged business logic into a comprehensible entity. The product concept is an evolving set of documents, supporting the integration of different viewpoints (e.g. user, product, and technology), definition of new product features, setting of technology development goals, drafting of marketing strategies, and processing of market feedback. A clear product concept and an ability to demonstrate product features are essential in search for potential lead customers. Your business case shall be based on the value created to the customer.

For industry consortia and research institutes

Establish pilot production facilities and related services for manufacturing of prototype products and product demonstrators. Such facilities would provide resource-strapped start-ups and SME with the means to test new technologies, demonstrate new product concepts and to boost customer traction. Both small and big companies could make use of the facilities in exchange for a use-based fee, and especially smaller companies would benefit by not being forced to make expensive upfront investments. It is also essential to involve players from all branches of the current / potential value chain, including big product companies and brand owners, to stimulate the development of the OLAE value chain and the applications market. For established companies the benefit of being involved would be networking with new potential suppliers and technology providers (first-mover potential).

For government and municipal agencies

Develop markets for new technologies, products and services through public procurement. The "Small Business Act" for Europe (SBA), adopted in June 2008, stresses the importance of facilitating SMEs' participation in public procurement and helping SMEs benefit more from the Single Market. While many member countries have taken concrete measures to facilitate SMEs' access to markets, e.g. by dividing large public contracts into smaller lots, governments could do much more by assuming the role of the lead customer in new emerging technology sectors with a large potential economic, societal and/or environmental impact (e.g. by promoting the use of energy-efficient OLED lighting in public offices). Using this governmental entry market as a 'platform' for technology, product and service development, companies would gain invaluable experience and would be better equipped to address other markets, too.

For European OLAE clusters

Create New Electronics Finance Platform (NEFIN). The general scarcity of seed and early stage funding (risk capital) combined with the challenge of generating steady cash flows constitute a severe impediment to the development of European start-ups and SMEs in OLAE. An intermediating body (NEFIN) should be created to facilitate start-up and SME access to finance and to scan and evaluate potential investment targets for investors. NEFIN would not set up a fund of its own, but would carry out its own research, provide advice for entrepreneurs, investors and financial intermediaries, and coordinate related activities, such as Venture Forums. The technology focus would be on 'new electronics', including related fields of electronics, photonics and printed intelligence to secure broader investor interest, where risks are high and lead times are long, but where the envisaged long-term societal impact is also significant. NEFIN could be first structured as a Work Package or Work Task in an EU-funded Coordinated Support Action. One of the project objectives would be developing a long-term operating model for NEFIN, preferably a legal entity capable of financing its own operations.

Impact

WP1 has identified and leveraged synergies between national and regional activities throughout Europe. Thanks to the set-up of an ERA-NET in organic electronics (o.e.), the European industry is expected to better benefit from the R&D in o.e. which is carried out throughout Europe.

With WP2 – Open-site information database – PolyMAP has provided the (European) stakeholders – i.e. the device manufacturers, the equipment and materials suppliers and the research – with clear answers concerning:

- **What is the history and state-of-the-art of materials and devices?**
- **What type of equipment is used, is available and what are limitations?**
- **How to measure the essential properties of materials/devices (=standards)**

SMEs are essential for the successful commercialisation of o.e. technologies and related products in Europe. However, they are under-represented in EC projects today. In coordination with OPERA – via PEF –, WP3 “Support to SMEs” has contributed to strengthen the position of SMEs and help them to successfully commercialize organic electronics products and technologies.

PolyMAP has assessed the candidate process/material mix and provided the European Stakeholders with clear guidelines regarding the potential of these new manufacturing paradigms. PolyMAP also provided fruitful insights concerning capital investments to the stakeholders.

On this basis, the entrepreneurs can seize these opportunities, plan the set up of production facilities on sound basis and create local and sustainable employment, instead of outsourcing risk and production fabs in the Far East.

List of publications

During the project the PolyMAP partners have contributed to several publications of the Quadriga Newsletters, which can be found on the QUADRIGA website: <http://quadrigaorg.eu/index.php?id=22&lang=EN>.

Next to this a Research Note was written and published in June 2011 on the support for SMEs: Promoting Entrepreneurship in Organic and Large Area Electronics in Europe, Jari Kettunen, Ilkka Kaisto, Ed van den Kieboom, Riku Rikkola and Raimo Korhonen; Issues and Recommendations. This note can be found through a link on the oe-a.wiki website (http://www.oe-a-wiki.org/index.php?option=com_content&view=article&id=136:promoting-entrepreneurship-in-olae&catid=143:olae-organic-large-area-electronics&Itemid=189).

The address of the project public website

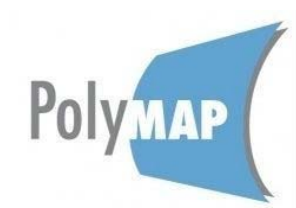
Project Website: <http://www.polymap.eu/>

Online database: <http://www.oe-a-wiki.org/>

Beneficiary	Contact name	e-mail address
1. TNO	Herman Schoo	Herman.schoo@tno.nl
2. Fraunhofer EMFT	Andrea Zeumann	Andrea.zeumann@zv.fraunhofer.de
3. CEA	Yves Hussenot	Yves.hussenot@cea.fr
4. PEF	Ed van den Kieboom	Ed.vandenkieboom@plasticelectronics.org
5. VTT	Juha Palve	Juha.palve@vtt.fi

The information on national funding and the report on national OLAE activities can be requested by sending an e-mail to: herman.schoo@tno.nl

Project logo and promotion material of the project, project website



Coordinating efforts in the field of organic and large area electronics

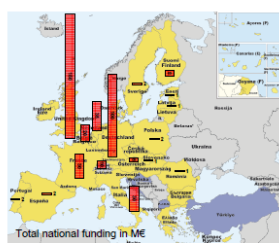


Why PolyMAP?

Streamlining activities in the European organic and large area electronics scene

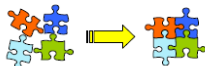
- EU is well-positioned in organic and large area printed electronics (OLAE)
 - ✓ Leading device makers (SME's and large enterprises)
 - ✓ Material and equipment suppliers
 - ✓ Research institutes
- However: strong competition from Asia and USA
- Keep technology leadership in EU and turn this into market and production leadership

National funding in organic electronics

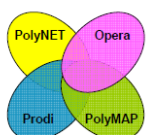


Scattered activities at national level, but EU in total: 400 ME

Cooperation and coordination is vital for competitiveness of European R&D



PolyMAP – Part of the “Quadriga”



- Quadriga is a line-up of four FP7 programs
 - ✓ PolyMAP (<http://www.polymap.eu/>)
 - ✓ PolyNET
 - ✓ Prodi
 - ✓ Opera



PolyMAP consortium partners

TNO / Holst (NL) Fraunhofer IZM (GE)
CEA Liten (FR) VTT (FI)
Plastic Electronics Foundation (NL)

Main achievements

- National funding bodies from UK, NL, GE, AT (and probably later also FI and FR) are investigating the possibilities to coordinate their national OLAE activities on an European level (e.g. via ERA-NET+)
- Open source database for roadmapping and state-of-the art in the field of OLAE: <http://www.polymap.eu/joomla/index.php>
- 56 support letters signed by the main stakeholders from industry, research institutes and universities

Please support our efforts to strengthen the position of Europe as the leading force in Organic Electronics worldwide!!!