

Future Scenarios for Materials Innovation in Øresund

Øresund Materials Innovation Community

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Grand Challenges are fundamental problems in science and engineering, with broad application and deep impact. Developing intelligent drug delivery systems, gearless windmills, computational dynamics for long-term weather forecasts and techniques to manage the nitrogen cycle will ameliorate life for millions – and create massive business opportunities.

Solving Grand Challenges will involve private and public research, private and public investments and advanced laboratory facilities.

In most cases, groundbreaking discoveries start at the atomic level. Whether the problem revolves around bio-membranes, magnetism or polymers, it is essential to understand how materials work and interact, at the most fundamental level. Because of this, advanced laboratory facilities will be even more important in the future.

Today, the Øresund region is an important node in the global network of universities, companies, research facilities, regions and investors working with research and innovation in hard, soft and biological materials.

The research clusters around the decommissioned Risø reactor, the three generations of MAX synchrotrons and the nano cleanrooms at DTU and LU have steadily developed their strength for decades. Years of collaboration with companies and hospitals have created tangible top line and bottom line results, as well as well-established modes of triple-helix collaboration.

The decision to locate the world-leading facilities ESS and MAX-IV in Lund has strengthened the regions value proposition to scientists and companies alike. MAX IV and ESS will be operational within a decade, but already now the region is preparing to merge efforts across regional and organizational divides.

Since 2009, a large number of partners have joined efforts in the Øresund Materials Innovation Community project and in other projects with a similar scope, notably TITA, Nano Connect and CATE. Together, these projects engage a substantial number of stakeholders in the greater region, including national research agencies, regions and



municipalities, universities, investment agencies, science parks, industry confederations and the research facilities themselves.¹

The Øresund region will be pivotal in the global effort to use advanced materials characterization to address grand challenges, and with proper planning, the region will prosper – to the shared advantage of Øresund and the world.

Øresund Materials Innovation Community

The ØMIC project was launched in 2008 as a first effort to join relevant stakeholders in preparing the region for MAX IV and ESS. The project is financed by Interreg 4A and runs through 2012.

At the outset, the ambition of ØMIC was to prepare the ground for a KIC application in materials science, with the Øresund University serving as secretariat. From a regional perspective, this ambition is relevant and justified, but with the decision of the owners of ØU to in-source regional development projects and Interreg competencies, any KIC initiative must be rooted in a new cross-border organization.

The aim of Øresund Materials Innovation Community is to create a community between relevant stakeholders in the cross-border region of Southern Sweden and Eastern Denmark. The activities have centered on:

- Community building
- Education planning
- Early innovation
- Science Parks
- Regional branding
- Analyzing international experiences
- Future planning

In each of these work-packages, project partners have collaborated to achieve tangible goals and to build a dynamic and active network of stakeholders and experts.

As the project draws to an end, it is time to start summing up findings and prepare for further projects or collaboration platforms. The purpose of this paper, which is based on

¹ Vinnova, Danish Agency for Science, Technology and Innovation, Region Skåne, Region Hovedstaden, Region Sjælland, Region Blekinge, Region Halland, Västra Götlandsregionen and all the municipalities of Skåne. KU, LU, Malmö Högskola, CBS, RUC, DTU, Högskolan Kristianstad, Blekinge Tekniska Högskola, SLU Alnarp, Chalmers University, Halmstad University, University of Gothenburg, Aarhus Universitet and the University of Oslo. Invest in Skåne, Copenhagen Capacity. Ideon, Scion DTU, Væksthuset 5te, Væksthus Central Danmark. ESS and MAX-Lab. The Chamber of Commerce and Industry of Southern Sweden, Oslo Teknopol, Confederation of Danish Industry, Confederation of Swedish Enterprise.

discussions with individual partners, in work-package groups and on a Future Planning seminar in April, 2012 is to describe goals for future collaboration in the ØMIC partnership and within the region.

Findings

The key findings after three years of project time and planning are:

- Material science is as global as the Grand Challenges. Universities and companies around the world are engaged in scientific exploration, innovation, research and development, using large scale facilities and small labs everywhere.
- The Øresund region is an important node in a global network, and this position will be strengthened when MAX IV and ESS start bringing in cutting edge scientists from a multitude of disciplines to perform experiments here.
- ESS and MAX IV will boost science, innovation, research and development globally and allow the Øresund region a chance to attract businesses, start-ups and highly educated people.
- The Øresund region has a sufficient level of knowledge to start acting.
- The Øresund region needs a permanent organization to coordinate activities and secure high-level engagement
- Future projects need to be focused and grounded in a larger frame.

These key findings are the basis for the following project ideas for future scenarios. The project ideas are grouped in four major areas:

- High Level Coordination
- University Collaboration
- Communication
- Innovation Community

High Level Coordination

There is an urgent need to establish an Øresund Material Alliance.

The presence of ESS and MAX IV will be one of the few, truly unique selling points of the region. It will boost our current strengths in life science and clean tech, and it will provide the opportunity to attract highly skilled professionals and high-end companies and start-ups.

Projects like ØMIC, TITA, NanoConnect and Cate have established a very dynamic network of professionals within research, regional development and, to some extent, companies. A vibrant network of professionals is key to facilitate the random meetings of scientists, innovators, entrepreneurs and venture capitalists.

However, in order to reduce red tape, establish regional infrastructure, secure incubators, facilitate communication and fund inward investment activities, create flexible schemes for foreign talents and their families, etc. a binding agreement between regional and national authorities is crucial.

A platform of ministers, regional heads, university rectors and heads of industrial organizations must be established in order to secure high-level coordination and political focus.

The long-term potential of ESS and MAX IV far exceeds any other growth area in southern Scandinavia and all barriers cannot be addressed bottom-up.

The community of professionals cannot and should not be coordinated, but an organization working on behalf of the high-level coordination committee can facilitate the community, keep up the momentum and assist inward investment agencies in branding efforts and external communication.

Future projects

- ØMIC is not the proper framework to establish a high-level coordination committee, but partnering organizations all have access to higher-level officials, and a platform should be organized in order to secure maximum support and leverage of the huge investments in research infrastructures.

University Collaboration

The original scope of university collaboration within ØMIC was to instigate collaboration between regional universities, map out the disciplines and programs that will (or might) benefit from MAX IV and ESS and to establish a summer school.

These goals are being met in the project, and a number of platforms have arisen and pointed to new fields of collaboration.

Most importantly a working group for coordination of educational activities within neutron and X-ray scattering in the Øresund region has been formed. The group consists of professors, associate and assistant professors and post-docs from KU, LU, DTU, RUC, MAH and the MAX laboratory. The group members represent the hands-on teaching and research expertise of their institutions, and many of them also partake in the strategic forums of their institutions. The working group will continue to exist post-ØMIC and work to ensure the continuation of the summer school.

Future projects

- The mapping of regional university courses with a high extent of X-ray or neutron science should lead to initiatives to secure pooling of resources. First step is to make a permanent, regional platform for knowledge sharing and collaboration on education.
- To keep the mapping up to date and the information available, a joint web-platform should be established. This platform should accommodate project matchmaking to invite students from different universities to do projects together.
- Student mobility is a very important factor in long-term regional integration. Current legislation prevents students from taking courses across national borders and it is paramount that this issue is resolved.
- Teacher mobility is an important tool in promoting the growth of the X-ray and neutron science community. A platform for pooling of regional resources and sharing of guest professors should be established.
- The ØMIC summer school should be a recurring event and a project organisation must be made to ensure this.
- Pooling resources could lead to very specialised and shared educational programmes.
- ESS and MAX IV will cater to a world of specialised scientists. In order to grow the regional community of specialists, we should consider building educational beamlines. Educational beamlines funded by regional universities and authorities would attract young students to the fields and it would attract talent from the whole world. This would highly benefit research and innovation in hard, soft and biological materials in the region.
- Teaching material for K-12 and inspirational exhibitions should be developed in order to sparkle interest in X-ray and neutron science.
- We need the best physics and chemistry teachers in the world – and we should develop programmes to educate and inspire K-12 teachers in order to secure this.

Communication

Being the best is fabulous, but if the region is to reap the riches, the wow-effect must be communicated in broad and focused areas.

Differentiated communication must target several groups:

- Scientists
- Investors
- Companies
- Politicians
- Educators
- The general public

Today, different organizations address these groups with a variety of interests. Science and innovation in hard, soft and biological materials has a huge potential in addressing global grand challenges, and the Øresund region has a chance to occupy the center of an international dialogue.

In order to strengthen the communication effort and maximize regional effect, a joint platform should be established.

The ØMIC project has looked upon international branding of the Øresund Region related to research and innovation in hard, soft and biological materials. Copenhagen Capacity and Invest in Skåne have been the driving forces. They will continue to work on the international branding, incorporating it into existing and upcoming areas of strength. The collaboration between the two actors will continue through projects and common participation at international fairs and conferences.

The international branding of the Region is an important step towards attracting companies to establish research facilities in the Region. The ØMIC project suggests a two-step plan for the establishment of lab facilities. First step is to continue the work that has been running parallel with the ØMIC project, where the universities in the region have been driving forces in the establishment of new lab facilities. Second suggested step is to be initiated close to the completion of ESS or MAX IV and should focus on getting private companies to establish facilities. Based on the experience from the universities a tailored communication effort should be designed.

Future projects

- Materials of Grand Challenges has been established as an annual summit and a webpage. This platform should be made permanent and funding secured.
- A joint Øresund organization for X-ray and neutron science and innovation should take responsibility for coordinated communication efforts.
- Value based communication is a unique competence of Scandinavian countries and companies. Material sciences hold the promise of addressing problems we all share, and this should be the basis of communicating through shared engagement.



- ESS and MAX IV must be 'made relevant' for the general public and communicated as regional asserts.

Innovation Community

Silicon Valley and Hong Kong are two extremes of dynamic high-tech innovation hubs.

In Hong Kong state authorities market services for businesses and make university collaborations available for entrepreneurs and developers. The state services do not limit the freedom of businesses to operate and to chose sub-contractors, but the establishment of Hong Kong Science and Technology Parks, the determined marketing efforts and the subsidizing schemes are meant to create a vibrant high-tech hub that will bring massive return on investments for Hong Kong and Mainland China.

Silicon Valley has no central coordination and very little government participation. It is powered by the presence of major blue chip companies and major private and public research universities – and by the migratory patterns of entrepreneurial professionals.

Øresund cannot copy Silicon Valley or Hong Kong. The resources are not available. But we have the time and the potential to create an innovation community within the next five to ten years.

Future projects

- An analysis of the regional companies' readiness to transform X-ray and neutron based discoveries to innovation must be carried out in order to determine near-future policy goals.
- Funding schemes for projects within material science and innovation should be examined and seed money established.
- Meeting places are a central feature of well-established innovation communities, and we should investigate the social practices of the scientists, entrepreneurs and venture capitalists in order to create the best-suited kinds of meeting places in the Øresund region.
- The Scandinavian countries have a long history of user-centered thinking in design and in public service. This tradition should be used in determining how to capitalize on the presence of high-ranking scientists in the region. Using advanced qualitative methods would provide deep understandings of the unmet needs of beam time travelling scientists and entrepreneurs. A qualitative research project should be initialized.
- In specialized fields where materials science is pivotal, such as lightning and clean tech, focused cluster projects should be established. This will bring the existing scientific possibilities closer to actual needs in companies and pave the way for shorter-term growth.
- Creating industry portals and allowing companies fast access to smaller scale instruments that are available now, will help companies prepare for the use of ESS and MAX IV. Targeting communication about the services and possibilities in research infrastructures to small and medium sized companies will accelerate innovation.

Conclusion: Post-ØMIC planning

The over-riding goal of Øresund Materials Innovation Community is to tie the region together. In order to do so, the project has followed a philosophy of delegating competence to the legitimate owners of the many activities, possibilities and challenges in the field; and of empowering project partners by facilitating their search of potential partners and projects.

As a consequence, a deep pattern of shared interests has emerged. Some of these are national, some are regional and some reach out internationally. Some of these are rooted in universities: in teaching and research, in recruitment and out-reach – others are rooted in regional development or in questions about procurement and R&D in companies.

Since the beginning of ØMIC, a number of projects have emerged. Some of them are linked directly to ØMIC while others slice out a fragment and deal with it from a singular perspective.

Among these projects are TITA, CATE, ESS og MAX-IV som vækstmotor for Hovedstadsregionen, Science Link, Øresund Smart Specialization. A number of smaller scale initiatives have achieved permanence – like the summer school, the e-learning initiative, the ongoing dialogue between Invest in Skåne and CopCap, etc.

All in all, the community exists and the field has been substantially empowered by the regional development funding.