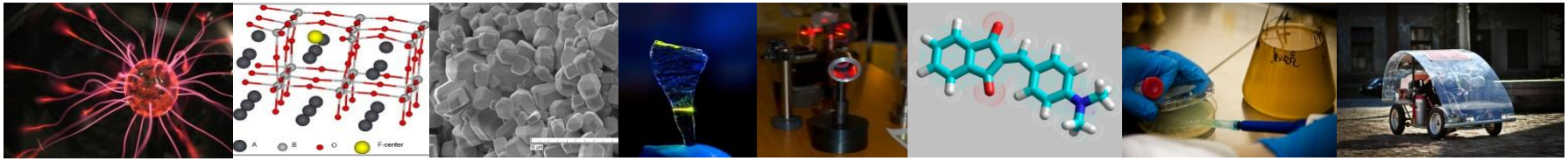
Institute of Solid State Physics, University of Latvia

ISSP UL *Status quo* and Development Strategy

Scientific institution in Europe 2030

April 19, 2016, Riga, Latvia



The Excellence Centre of Advanced MAterial Research and Technology - CAMART
Started its activity January 1, 2001

After the concept of **European Centers of Excellence** in Central and **Eastern Europe Candidate Countries** in the **5th Framework Programm** of the European Community

(34 Centers selected; one Center for Latvia,
Project coordinator: Institute of Solid State Physics University of Latvia)

The ISSP UL has become an internationally recognized institution, and a leader in the material sciences and cross-disciplinary topics in Latvia

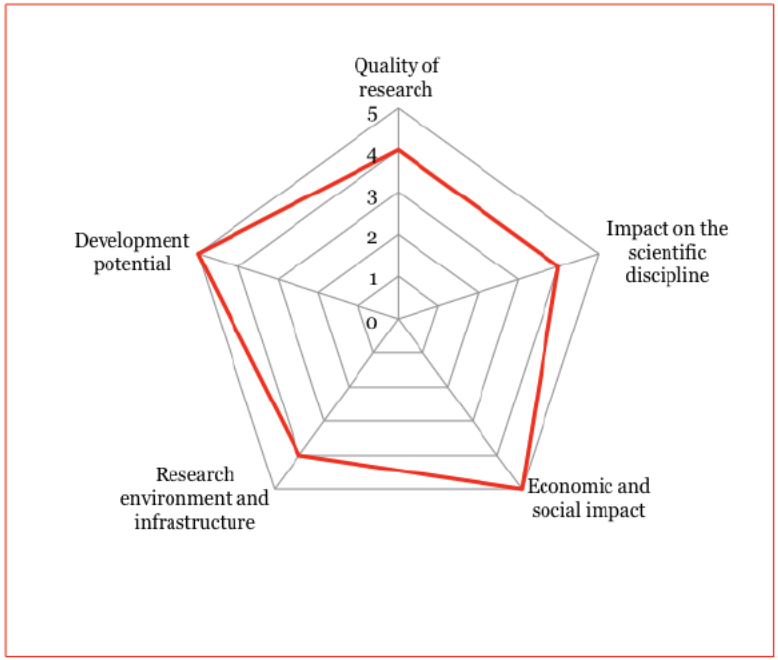
Our mission:

To transfer excellence in material science into highly educated people and innovation

Learning , Research and Innovation

ISSP UL by Technopolis Latvian Research Assessment

Criteria	Scores
Quality of research	4
Impact on the scientific discipline	4
Economic and social impact	5
Research environment and infrastructure	4
Development potential	5
OVERALL SCORE	4



Conclusions and recommendations

This institution is one of the best - arguably *the* best institution evaluated by Panel M. It has all the qualities to continue its role as the leading centre of Latvian research in material science. Securing funding for the Institute should be of highest priority for the Latvian Government and Latvian research funding agencies.

ISSP UL Strategy & Research Programme

ISSP UL have granted ERDF project Nr. 2DP/2.1.1.3.3/15/IPIA/VIAA/011. «Development of Institutional Capacity of ISSP UL»

Within a project 512 kEUR was used to:

- Work out ISSP UL strategy for 2015 – 2020 and beyond including:
  - Research Programme;
  - Infrastructure development plan;
  - Cost/Benefit analysis for infrastructure development;
- Improve management systems for:
  - Resources;
  - Performance;
- Improve Research infrastructure (~200 kEUR);
- Increase accessibility to scientific databases (int.al., Nature un SPIE);
- Tighten collaboration with Universities;

ISSP UL Strategy

Strategy goals are:

1.People
Raise potential of the staff attracted and retained by seeking and being part of high quality research projects, maintaining motivating work environment and supporting educational programs and multidisciplinary skills development

2. Excellence
Strengthen the ISSP UL excellence by sustaining high level scientific research, developing environment for innovation and providing effective governance over ISSP UL knowledge, assets and services while balancing the fundamental and application driven researches

4. Infrastructure
Build and maintain ISSP UL infrastructure that enhances research quality and capacity

3. Collaboration
Enhance ISSP UL international cooperation with academics and industries to digest the scientific and industrial needs into the research and innovation projects

ISSP UL Strategy

Strategy document puts forward:

- ISSP UL Vision;
- Mission;
- Research directions;
- Strategic goals;
- Tasks to achieve the Strategic goals and their Indicators.

The Strategy is supported by:

- SWOT and PEST analysis;
- Research Programme;
- Institutional development plan;
- Human Resources development plan;
- Infrastructure development plan
- Cost-Benefit Analysis.

ISSP UL strategy was developed in collaboration with
PricewaterhouseCoopers

pwc

ISSP UL Research Programme

ISSP UL puts emphasis on four top priority research and innovation directions:

I. Thin films and coating technologies;

II. Functional materials for electronics and photonics;

III. Nanotechnology, nanocomposites and ceramics;

IV. Theoretical modelling and experimental studies of materials structure and properties.

…for application in:

I. Energetics – renewables and energy harvesting (photovoltaics, hydrogen, fuel cells, thermoelectrics, fusion), energy economizing (solid state lightning - OLEDs&LEDs, luminiscence, up-conversion);

II. ICT - micro&nano – electronics, photonics

Thin films and coating technologies –
Development of technology and equipment

SIDRABE

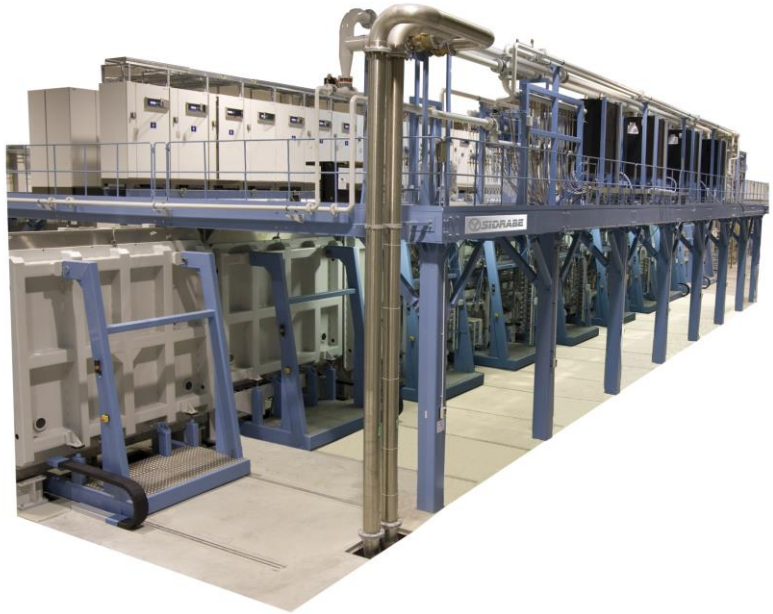
Design and manufacturing of unique thin film vacuum deposition equipment for:

- **production of photo-voltaic cells flat screen displays as**
- **fabrication of architectural glass**
- **roll-to-roll coated webs.**

Thin films and coating technologies – Development of innovative products

groglass

GroGlass factory in Riga, Latvia



Major producer of anti-reflective coatings on large glass sheets (3350 mm x 2250 mm) to the Architectural, Technical, Picture Framing, Solar and Horticultural industries (received the best exporter 2012 award in Latvia);

Functional materials for electronics and photonics – Flat panel production technology

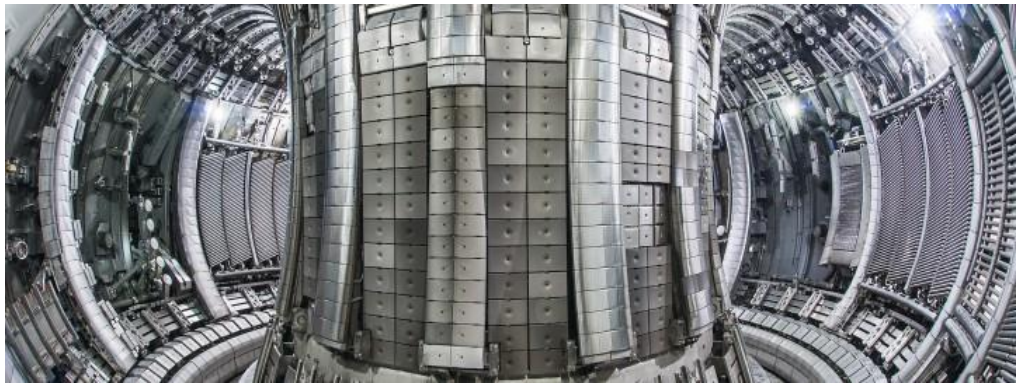
EuroLCDs

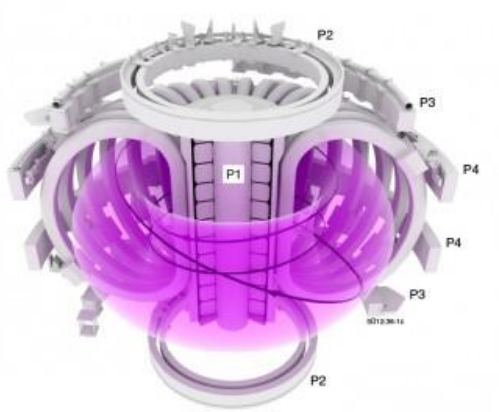
Shutter type LCD products for:

- **industrial applications;**
- **emerging 3D visualization applications.**

WPMAT – one of the important tasks in EOROfusion Programme

- Challenge – materials that would be suitable for the exploitation under the extreme conditions in Tokamak reactors
  - radiation and temperature resistant ODS (oxide dispersion strengthened) steels





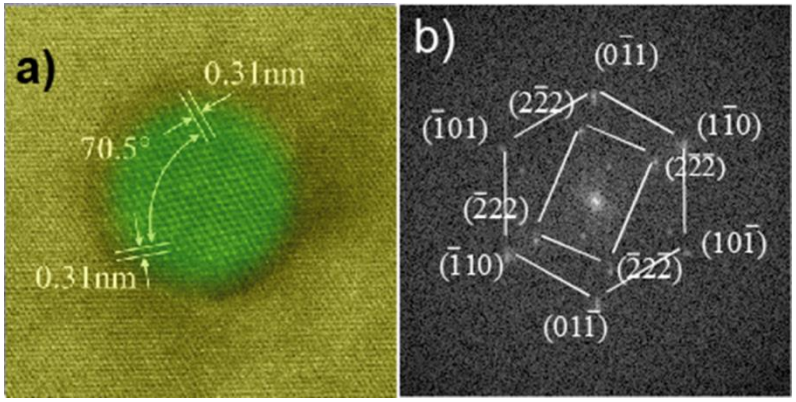
Karlsruhe Institute of Technology

AWP15-ENR-01/UL-014.2: When and how ODS particles are formed?

Subtask Specification: Atomic-scale modelling of ODS steels

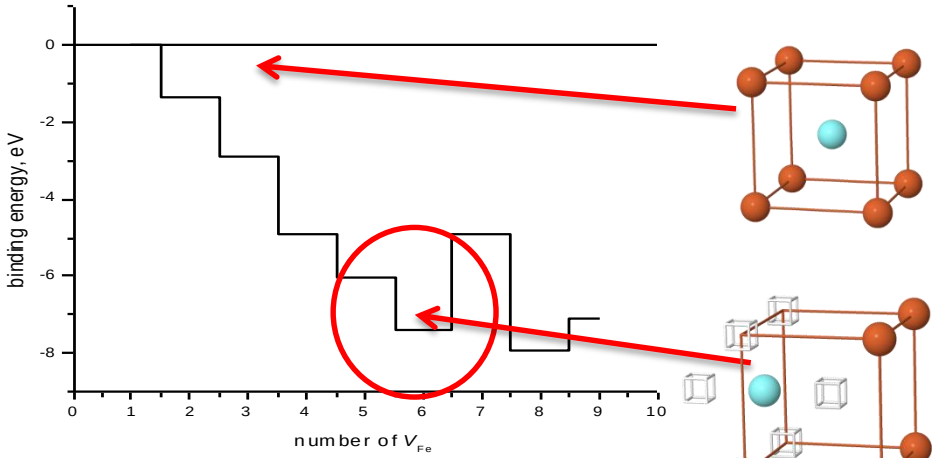
Objectives: a) Clarification of the mechanism for nucleation of Y_2O_3 precipitate in the ferritic steel lattice, which significantly improve mechanical properties and radiation resistance of ODS steels.

b) First principles and lattice kinetic Monte Carlo (LKMC) simulations are expected to provide valuable data on the size, shape and spatial distribution of ODS particles in steel lattice.



Experiment performed in KIT: HRTEM micrograph of Y_2O_3 nanoparticle embedded into ferrite matrix (a) and its Fourier transformation (b). The parallel orientation between directions of Fe (110) and Y_2O_3 (111) was confirmed for various small ODS particles.

Stabilization **of Y impurity surrounded by vacancies in α-Fe lattice according to results of *ab initio* calculations**



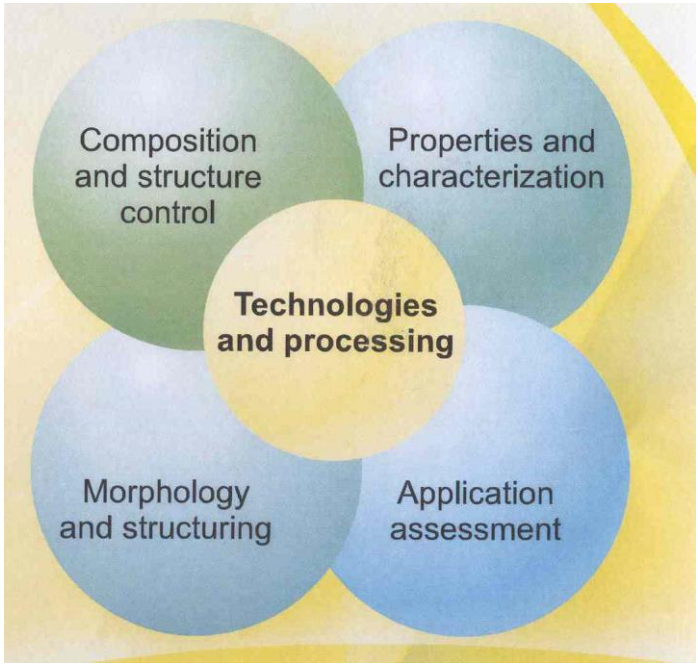
Size and spatial distribution of Y_2O_3 oxide precipitates significantly affect mechanical properties and irradiation resistance of ODS

ISSP UL Infrastructure development plan

To continue development of NRC -LATNANO-C: Open Access Laboratory

LATNANO-C priorities:

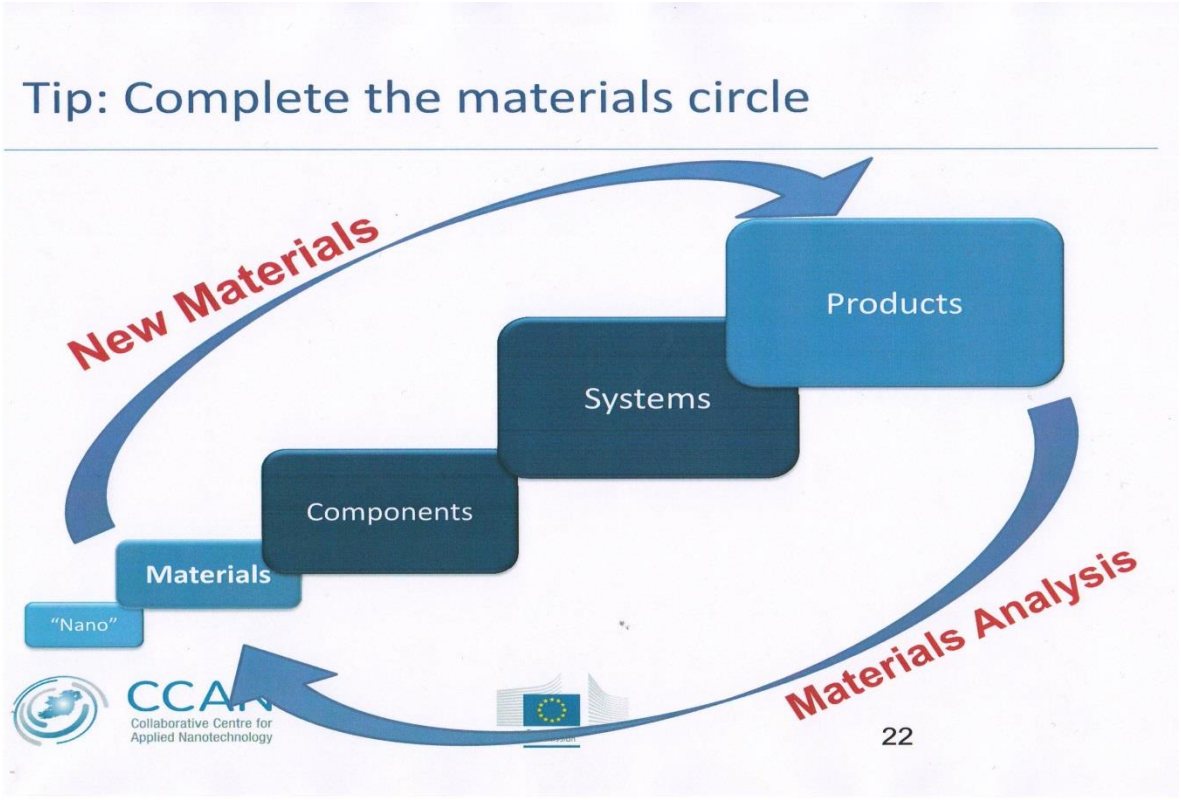
- Research and Development (R&D);
- Education (Master, PhD and Postdoc studies);
- Innovation (technology transfer, in close collaboration with High-tech enterprises);
- Research base for international R&D projects.



Main activity/policy fields

- *Nanotechnologies and advanced materials pilot lines for industrial value chains (pilot lines)*
- *Nanotechnologies and advanced materials for healthcare*
- *Nanotechnologies and advanced materials for energy applications*
- *Modelling and the European Materials Modelling Council*
- *Nano-safety, including risk assessment and support for regulation*

Materials alone does not make a product



ISSP UL Cleanroom Complex ~700 m^2 of class ISO5 to ISO8

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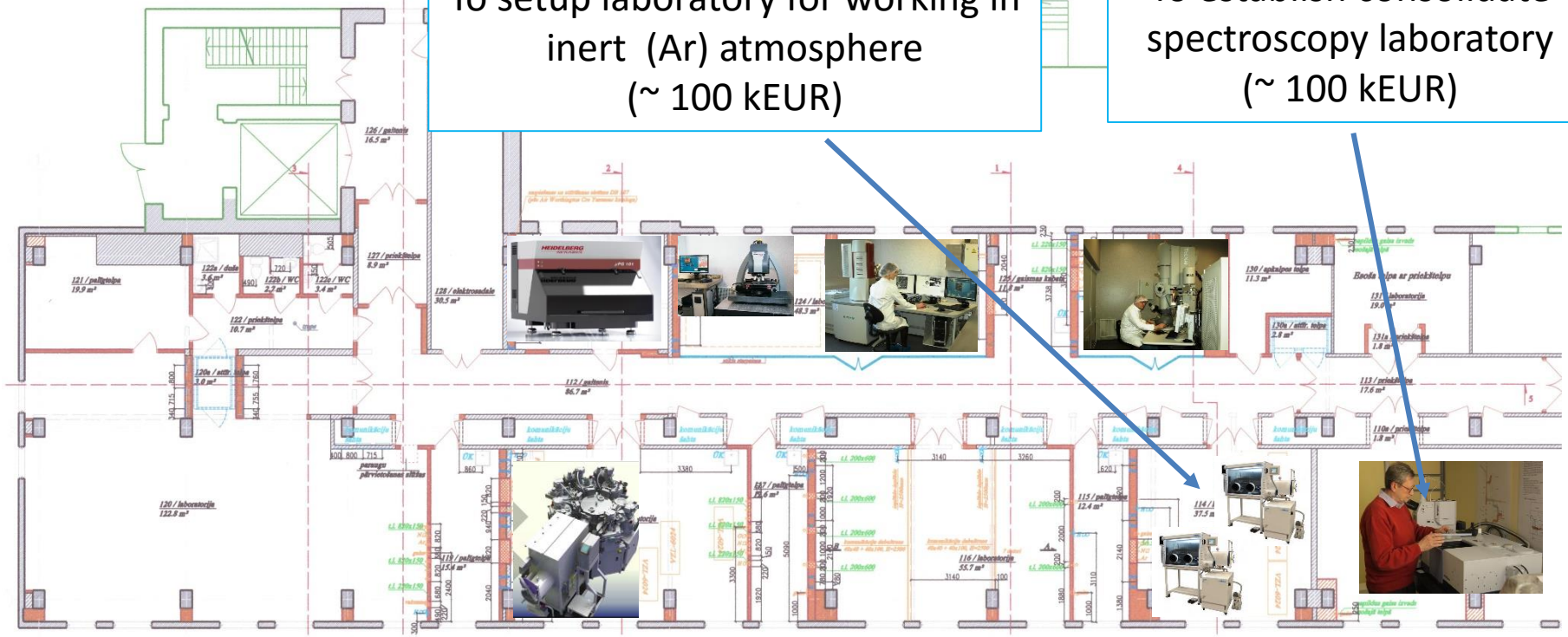
Development within ERDF project
Nr. 2DP/2.1.1.3.3/15/IPIA/VIAA/011

To setup laboratory for working in inert (Ar) atmosphere (~ 100 kEUR)

To establish consolidate spectroscopy laboratory (~ 100 kEUR)



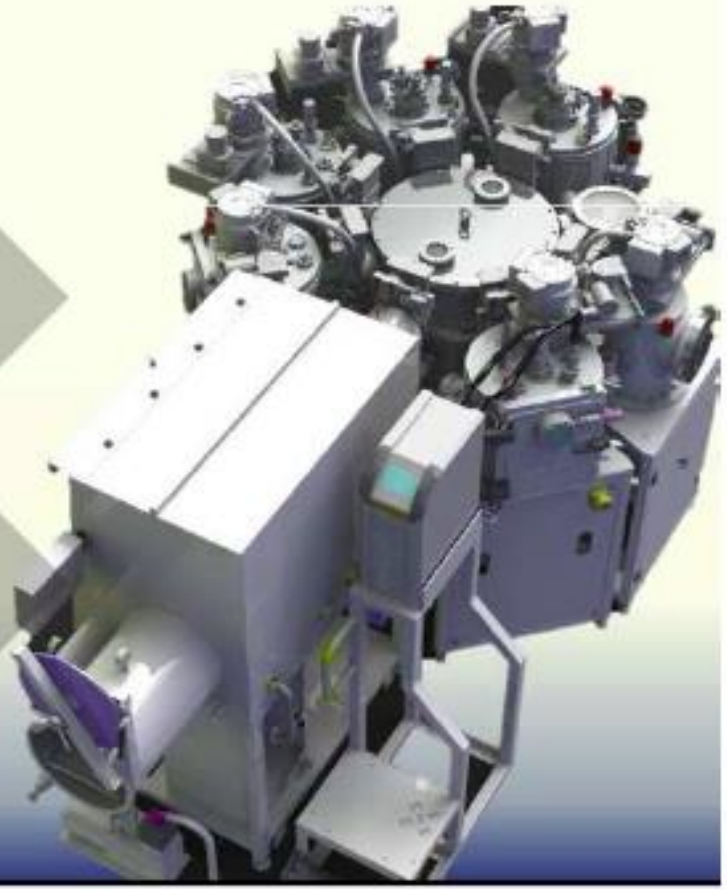
Thin films and coating technologies

SIDRABE

CLUSTER TOOL SAF

The multifunctional cluster tool is intended for:

- Research and development works, feasibility studies and general academic work in the field of thin film technologies
- Sample manufacturing aimed at product prototyping for market evaluation of out-of-box technologies



ISSP UL Infrastructure development plan

Building of additional laboratory space annexe for Technology Transfer Incubator

- Total area 4291 m^2
- Laboratory 3496 m^2
- Investment* 6033 kEUR
- Price per Lab m^2 1726 EUR

* *(inc.WAT)*

ISSP UL Strategy is to use Horizon - 2020 instruments

CAMART^2

H2020 Work Programme 2014-15:
Spreading Excellence and Widening Participation Call:
WIDESPREAD 1-2014: Teaming Project

The Excellence Centre of
Advanced MAterial Research and Technology Transfer
CAMART^2

Only one selected out of 6 projets for Latvia
(Overall– **3** better estimated from **169** applications);

Project coordinator:
Institute of Solid State Physics University of Latvia

CAMART^2 Thematic Specialization (accordingly RIS3 of Latvia)

- Thin films and coating technologies;
- Functional materials for electronics and photonics;
- Nanotechnology, nanocomposites and ceramics;
- Computational material science by atomistic scale modelling of technologically important materials and devices.

CAMART^2

ISSP UL Project partners:

KTH Royal Institute of Technology

- …
- KTH is among the world top universities (overall rank 117 in the Times Higher Education World University Rankings 2013-2014)
- recorded for Industry income- innovation score 100 out of 100 (Times Higher Education World University Rankings).
- …

Acreo Swedish ICT

- …
- more than 20 spin-off companies have been successfully started from Acreo since 1999
- …

H2020 project CAMART2 as next step in ISSP UL strategy

Development of Excellence Centre CAMART^2

During the **first phase** of the project **Bussiness Plan**, based on **Assesment, Roadmap, SWOT, PEST and CBA** analysis is ellaborated demonstrating the long term science and innovation development strategy

(deadline of the **first phase – May 31,2016**)

Proposed financial support for **second phase** of the project :

- **15 Mio EUR from H2020 -** raise **scientific capacity** - increase of quantity of qualified human resources, for exchange of experience, …
- **15+ Mio EUR** from **national (Latvia) finances** (incl. from **ESIF** funds) for development of **infrastructure;**

Necessary conditions It must be fortified with a forceful financial commitment document from Latvia government allocating at least equivalent funding from national, ESIF or any others resources for planned infrastructure development

Realization of the second phase: 5-7 years (2017 – 2024)

ISSP UL by Technopolis Latvian Research Assessment

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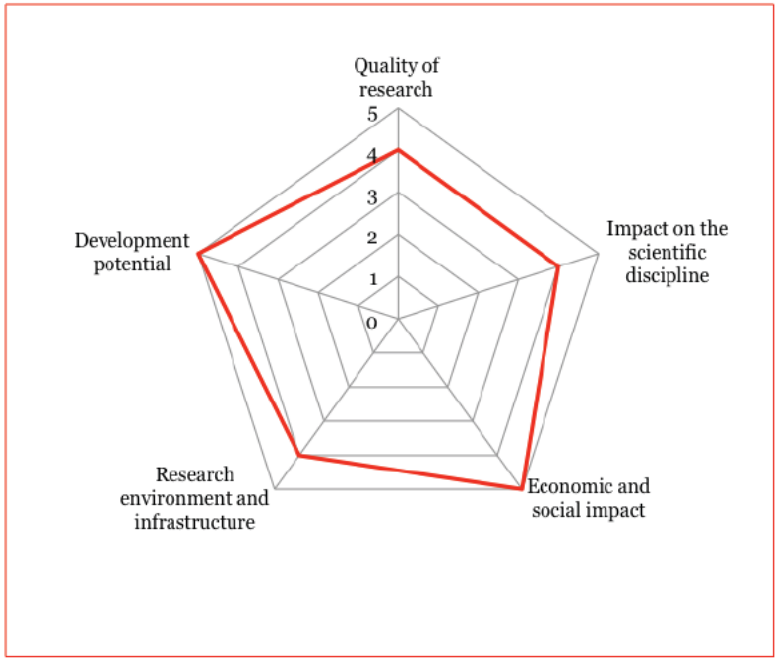

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H2020 project CAMART2 as next step in ISSP UL strategy

Merging of funds

Horizon 2020	Cohesion Policy Framework
Different objectives and intervention modes:	
• **EU level challenges** through **EU level open competitions** • **Promoting excellence** in research and innovation regardless of geographical location	• **Building regional/national capacities** for R&I (facilities, infrastructures, skills) • Aiming at **reducing regional disparities**
• Supporting mainly **individual and frontier research** • Awarded **directly to final beneficiaries**	• Supporting mainly **applied research and commercialisation** • Awarded **through shared management** through national or regional public intermediaries
With strong complementarities:	
Focus on building basis for having state-of-the-art EU products (industrial leadership)	Focus on commercialising of research to ensure economic growth based on market needs and critical skills

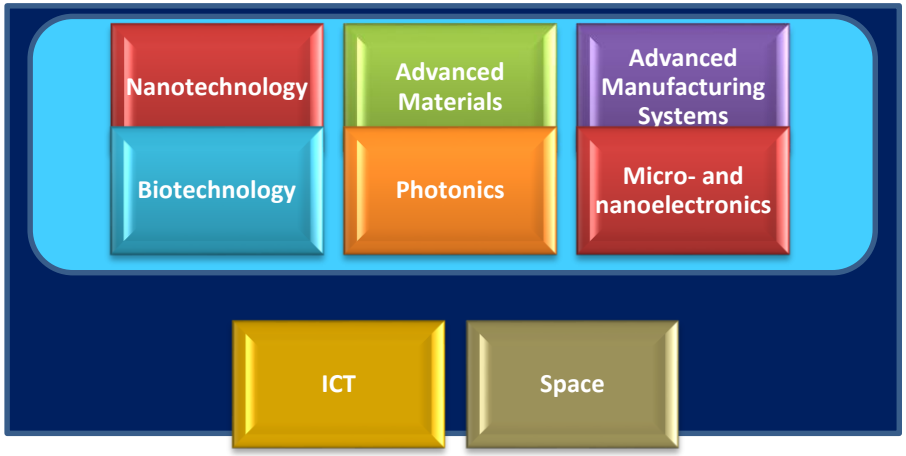
H2020 project CAMART2

National research programmes (NRP)	National Research Centres (NRC)	Competence Centres (KC)	Joint Technology Transfer Centres (JTTC) ~JRC

RIS3: Smart materials, technologies and engineering

ISSP UL : CAMART2 - ***Open Acces Laboratory – HILL (High Innovation Level Labortory) – in Latvia, extended use to BSR***

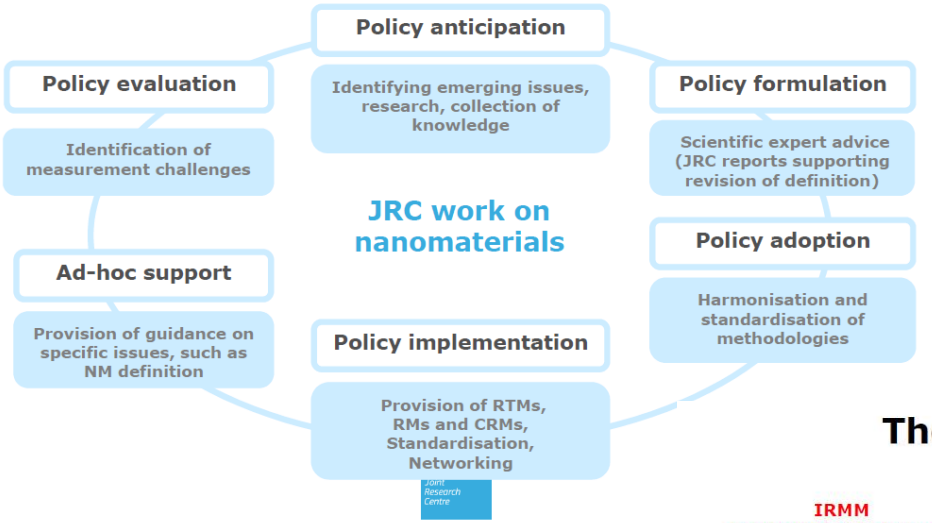
Key Enabling Technologies



The Joint Research Centre (JRC)

JRC in the policy cycle

To play a central role in creating, managing and making sense of collective scientific knowledge for better EU policies.



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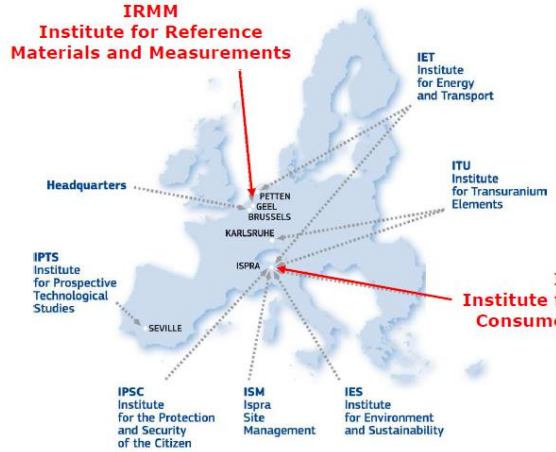

JRC

- European Commission's in-house science service
- Supporting EU policies with independent, evidence-based scientific and technical advice
- ~ 3.000 staff
- 6 locations

ISSP UL Infrastructure development plan

Cost/benefit analysis

of investments in infrastructure 2017 – 2022

Considered investment	MEUR
Research and Analytic Instruments	8.434
Technology Transfer Infrastructure	4.971
To complete renovation of existing building	2.700
Building of additional laboratory space annexe	6.533
Total	**22.638**

ISSP UL Infrastructure development plan

Cost/benefit analysis

period 2017 – 2036

Results of financial analysis

Results of financial analysis	Scenario 1	Scenario 2
FNPV without investment funding, kEUR	(60,763)	(26,762)
FNPV with investment funding, kEUR	(40,116)	(11,171)

Results of socio-economic analysis

Results of socio-economic analysis	Scenario 1	Scenario 2
Net cash flows	(56,205)	(25,073)
Fiscal corrections	7,626	2,037
Total economic benefits	77,639	24,828
Economic Net Present Value (ENPV), kEUR	29,060	1,792
Economic Rate of Return, %	16.9%	8.0%

- "Scenario 1" - ***Project*** Scenario with CAMART^2: the projections were made based on the assumption that the Institute implements the phase 2 of H2020 CAMART^2 project;
- "Scenario 2" - ***Project*** Scenario without CAMART^2: pessimistic scenario, assumes that the phase 2 of H2020 CAMART^2 project will not be granted for ISSP as expected in 2017-2024, building of new laboratory space annexe not planed.

ISSP UL infrastructure project CBA elaborated by *PricewaterhouseCoopers*

pwc

Stairways for excellence at ISSP UL:

Instead of valleys - up to HILL

Complementary logic

CAMART

LATNANO-C (NRC)

CAMART^2

HILL*

Thank You for Attention

*Advanced materials science HILL (High Innovation Level Laboratories)