

Nottingham, 6/7 Dec, 2005
Wolfgang Kaysser

GENNESYS
a new platform in Europe

Grand European Initiative on Nanoscience and Nanotechnology using Neutron and Synchrotron Radiation Sources

Nanomaterials Nanotechnology

New Innovations

Research Infrastructure

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Nanomaterials Nanotechnology

Structural materials

Aerospace

Energy and Environment

Nano Mechanics

Nano Devices

Information and Communication

Health

Nano Synthesis

Functional materials

Bio materials

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natural

manmade

Future Need GENNESYS

1cm 1mm 1µm 1nm

10⁻²m 10⁻³m 10⁻⁴m 10⁻⁵m 10⁻⁶m 10⁻⁷m 10⁻⁸m 10⁻⁹m 10⁻¹⁰m

microwave infrared UV soft X-rays cold neutrons X-rays neutrons

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Neutron and Synchrotron - Research in Nano Materials Science - Overview and Great Challenges - processing - engineering

performance

Agility

modelling

synthesis

diffraction

reflectometry

small-angle scattering

tomography

Neutron and Synchrotron Investigations provide solutions for Nano Materials Key Problems

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Nano-Phenomena	Nano-Materials	Nano-Technology I	Nano-Technology II
Structures	Structural Materials Metals Ceramics Polymers Biomaterials	Information	Prenormative Research
Properties		Bio-Tech	Chemistry
Synthesis	Functional Materials Electronic Magnetic Photonic	Aeronautics Automobile	Catalysis
Modelling		Energy Environment	

More than 150 experts from Universities, Research Centers, Industry and Large Scale Facilities

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3d Structure

Function

Performance

Degradation

Failure

Lifetime

Compatibility

atomic resolution

highest sensitivity (defects, impurities)

element specific

destruction-free

insitu analysis

ambient conditions

extreme conditions (temperature,...)

bulk sensitive

surface sensitive

buried functional interfaces

realtime studies (hours – subpicosec)

standardized instrumentation

standardized analysis

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3d Structure
Function
Performance
Degradation
Failure
Lifetime
Compatibility

European
Research Infrastructure
carries this potential

atomic resolution
highest sensitivity (defects, impurities)
element specific
destruction-free
insitu analysis
ambient conditions
extreme conditions (temperature,...)
bulk sensitive
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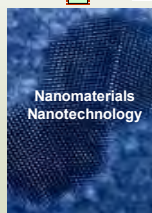
Key Barriers Breakthroughs
Design of Novel Material Key Barriers

↑ ↓


GENNESYS

↓ ↑

Nanomaterials
Nanotechnology



Infrastructures
Synchrotron Radiation
and
Neutron Facilities



Conclusions GENNESYS
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Breakthroughs in nanomaterials will create great potentials for next-generation technologies

The large facilities will be an essential element to achieve this goal

If Europe strives for a leading position (in the world) in nanomaterials science and technology the gap between materials communities in science and industry and the large facilities must be bridged

Therefore a scheme on European level needs to be put in place

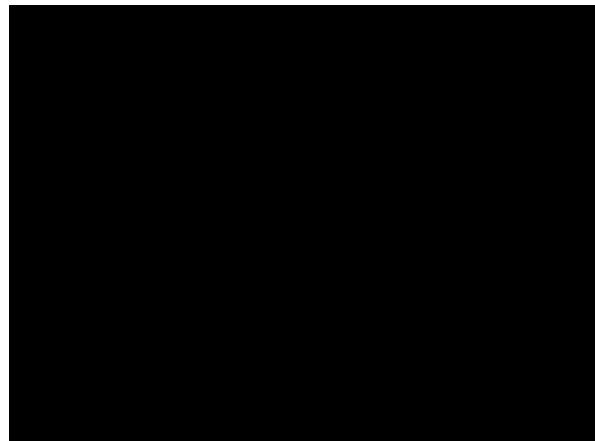
Nanosciences will offer great challenges to future innovations of larger scale facilities, for example:

- in situ observation in synthesis and industrial processing
- real time resolution in subpico seconds for degradation mechanism nanomaterials-
- real environmental conditions (e.g. industrial)

To realize these objectives National and European operational networking mechanisms will be adopted.


New mechanisms may have to be implemented, e.g. the creation of European Science/Technology Centers of Excellence in key areas.

Strategic document highlighting the research needs for the next decade will be issued by GENNESYS soon.



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European Commission
National and International
Funding Bodies

Organisation of GENNESYS

advice
recommendations

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GENNESYS programmes

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SR and N Facilities
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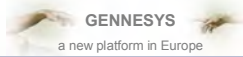
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Centers of Excellence
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Fundamental Aspects
Nanomaterials Research

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