

NANOWORLD RELIABILITY NETWORK

Reliability in the Nanoworld

Functionality and safety of any product or process during its whole intended life is defined by its reliability. Already essential for macro- and microsystems, reliability will even be more important in the nanoworld due to expected higher functionality and complexity of products. Although reliability estimates are already indispensable to validate visionary research and development of produceable and useable nano devices, only little work has been done so far to investigate critical reliability issues. It is well known from microsystems, that neglecting reliability in an early stage results in high costs later on in the lifecycle or even makes a supposedly revolutionary idea totally useless. Reliability theory and physics of failure of macro- and microworld are only partially applicable on the nanometer scale. Physical processes not scaling linearly with size and time dramatically change mass and heat diffusion, electrical conductivity, reaction kinetics, corrosion processes, etc.. Fatigue, friction, damping, wear-out and repair mechanisms have a different physical meaning on atomic or molecular scales. Redundancy and correlation of quantum systems require quantum statistics of states and entanglement of wave functions. Still reliability theory is generic and will be applicable with proper modifications.

Objectives

The network is established to share knowledge, tools and techniques, and expertise on reliability issues in the world of nanostructured materials and devices. Objectives are:

- Optimum use of research institutes and facilities for reliability studies in the nanoscale regime
- Transfer of scientific and industrial know-how basic for nanotechnology products
- Maintenance of a database of international activities in nanoworld reliability (web-pages, papers, reports, conferences, news, success stories)
- Organisation of workshops and seminars addressing reliability problems in nanotechnology
- Initiate research projects in the field of reliability in the nanoworld
- Link to reliability services and consulting

Scientific and Technological Activities

Network partners are active or interested in one or more of the following topics (listing not complete):

- Physics of failure of nano-structured materials and devices
- Reliability and failure rate estimates of nano-systems based on modeling of stochastic processes
- Reliability testing and failure analysis procedures including instrumentation
- Quality parameters of nano-devices, quality assurance and standardisation
- Design concepts for reliable nano-systems

Managing and Operation

EMPA, the Swiss Federal Laboratories for Materials Testing and Research, proposes to address these questions in an international network. The network is managed by the Reliability Centre of EMPA (<http://www.empa.ch/englisch/zentren/zzt>). Activities will be initiated according to the needs of partners.

The network has been identified to fulfill the requirements of the EC Survey of Networks in Nanotechnology of the Research Directorate-General. Scope and participants listing will be published in a publication "European networking activity in nanotechnology" and on the CORDIS server (Community Research & Development Information Service: <http://www.cordis.lu/nanotechnology>).

Managing and Operation

EMPA invites academic institutes or industrial companies interested in reliability and lifetime of nano-structured materials and devices to join the Nanoworld Reliability Network.

Memorandum of Understanding (MoU): Nanoworld Reliability Network

I understand the objectives of the Nanoworld Reliability Network as defined above.
I agree to participate in that network.

Name:
Adress:
Tel:
Fax:
E-Mail:
Web-Page:
Date.....Signature.....

My institute/company has the following competencies / works in the following fields

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To join the Nanoworld Reliability Network please fax or email this MoU to
Dr. Urs Sennhauser, Head Department Electronics/Metrology and Reliability Centre, EMPA,
Überlandstrasse 129, CH-8600 Dübendorf, T: 01 823 4173, F: 01 823 40 54, E: urs.sennhauser@empa.ch

If you have any further comments, questions, or suggestions concerning the Nanoworld Reliability Network don't hesitate to contact the EMPA Reliability Centre (<http://www.empa.ch/englisch/zentren/zzt>).