

MONA – Nanophotonics Technology Roadmap

The MONA Nanophotonics Technology Roadmap now available

During 2 years (2005-2007), the MONA (“Merging Optics and Nanotechnologies”) consortium has been working through workshops, symposia and expert interviews at establishing a roadmap for photonics and nanotechnologies in Europe. Almost 300 people from industry and academia have been involved in the construction of this roadmap that gives insight into the future of materials, equipment, processes and applications. It also highlights the European position and outlook with respect to nanophotonics, and offers recommendations.

The MONA roadmap identifies key nanomaterials having the strongest impact for nanophotonics. They are:

- **Quantum dots and wires in Si, III-V and II-VI**
- **Plasmonic nanostructures**
- **High-index-contrast Si and III-V nanostructures**
- **Carbon nanotubes**
- **Integration of electronics with photonics**
- **Nanoparticles in glasses or polymers.**

Equipment and processes are crucial for the improvement of the performance of nanophotonic devices.

- The processes that will have the highest potential impact on nanophotonics and at the same time have potential for mass production are **MOCVD, CNT CVD, colloidal synthesis, nanophosphor fabrication, sol-gel synthesis, OVPD, UV lithography, nanoimprint and etching.**
- The types of equipment and processes with the broadest field of applications are **MOCVD, MBE and colloidal chemistry** as bottom up technologies and **UV lithography, e-beam lithography and nanoimprint lithography** as top-down technologies.

The MONA Roadmap identifies key devices for major applications: displays, Photovoltaics, Imaging, Lighting, Datacom/telecom, Sensors and Optical Interconnects.

To download a copy of the roadmap: <http://www.ist-mona.org>
or ask for a hardcopy: laurent.fulbert@cea.fr



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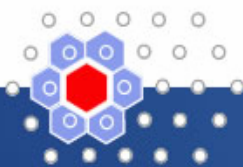
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Europe has a very strong R&D background in photonics, and specific efforts for each application should be done to stay competitive.

The key recommendations of MONA are:

- Provide support services for displays such as R&D and process equipment (CVD for carbon nanotubes for example), since strong European competencies exist in the field of carbon nanotubes, glass substrates and display systems. Moreover, Europe could benefit from OLED rigid display development by providing R&D services, materials and equipment. There is also room for innovation on flexible displays which are not industrialized yet.
- Develop quantum-dot technology for solar cells. The **photovoltaics** market is growing.
- Maintain R&D on **visible and infrared-sensing** in various application areas. There are industrial players in Europe (STM, e2v). Moreover, in infrared sensing, Europe has key players like Sofradir. These companies are interested in III-V quantum dots as an alternative to MCT and conventional QWIPs.
- Intensified R&D for Lighting. There is a large market for nanophotonics so securing a successful industrial development appears as an important objective. Moreover, the presence of two major European players (Osram, Philips) is a major asset.
- Maintain R&D for **datacom/telecom** (Bookham, 3S Photonics and many start-ups), specifically for further integration of optical and electronic chips.
- Europe should maintain its R&D on microstructured fibers, II-VI quantum dots and plasmonics for **nanophotonic-based sensors** (for example surface plasmon resonance instrumentation has been successfully commercialized by Biacore in Sweden).
- Maintain R&D competence in **optical interconnects**. This effort should be continued in order to compete with the USA where DARPA, big microelectronics companies (Intel, IBM) and start-ups (Luxtera, Kotura) are already very active.

The MONA roadmap has been developed in the context of world-wide contributions and competition. Strategic cooperation with roadmapping activities in Japan, Korea, Taiwan and the USA has ensured the overall relevance of the roadmap.

MONA should serve as an informed input for the future FP7 workprogrammes. In particular, the MONA results can be used to build upcoming strategic research agendas for both nanomaterials and photonics. To be useful, a roadmap has to be alive and evolving. The MONA roadmap will be regularly updated through the MONA website (www.ist-mona.org). It allows the nanophotonics community to stay informed on the research and industrial evolution of nanophotonics.



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