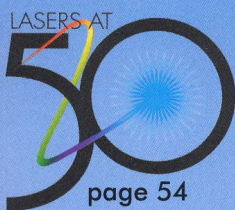
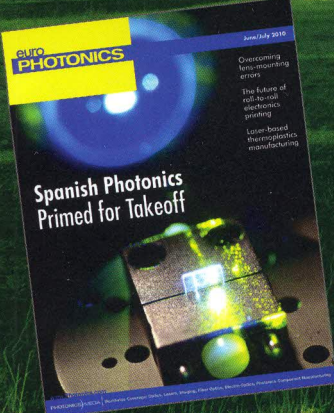
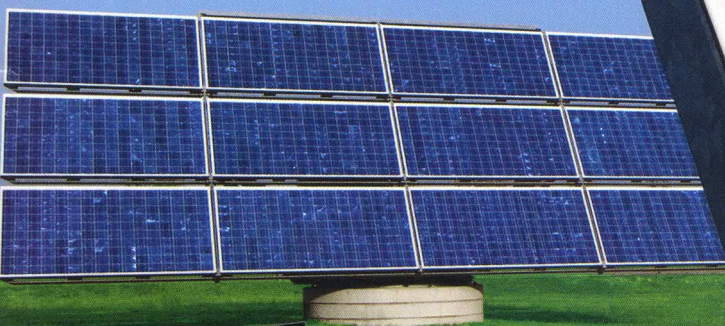


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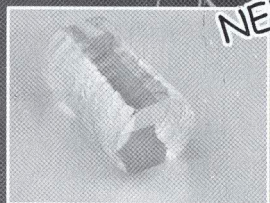


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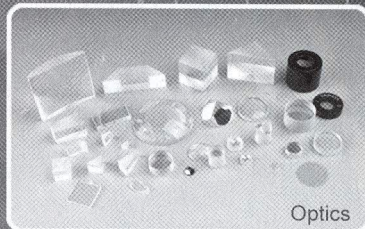
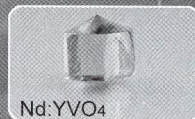
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needed here; in fact, the dispersive beam converts in a homogeneous profile at the workpiece – exactly what is needed. In principle, fiber lasers could be used, especially if they were cheaper or if their better beam quality were needed; e.g., for scanning applications with a long focal distance.

The main challenge when using lasers is the fiber reinforcing the typically transparent polymer material. It induces scattering and (multipath) reflections because of the difference in refractive index between the

thermoplastic matrix and the glass, reducing the absorbed power. The lack of absorption in the fiber itself can be the other challenge. Carbon fibers – as widely used in high-cost, high-performance parts – are black and absorb a wide spectrum. Glass fibers, however, do not.

Solving this problem is the next thing the researchers are working on – to address mass uses for glass-reinforced plastic, also known as fibreglass.

Dr. Jörg Schwartz
joerg.schwartz@photonics.com

Photonics in Spain: Open for business

CASTELLDEFELS, Spain – “Several industrial sectors related to photonics are growing in Spain, especially those related to energy efficiency and health,” said Silvia Carrasco, knowledge and technology transfer director at ICFO – The Institute of Photonic Sciences, based in Castelldefels, Spain. The institute arranges collaborations and partnerships with Spanish photonics companies and related customers.

“Biotechnology is one area in which the government and industries in the Barcelona metropolitan area are focusing resources and initiatives. Clean technology is another area that has great potential in Spain, as is reflected by current investments,” Carrasco said.

Founded in 2002, ICFO moved three years later into a fully dedicated building in the metropolitan Barcelona area. At full speed, it is expected to host more than 300 full-time researchers working in some 60 research laboratories. It is conducting wide-scope research in several areas of photonics, including information technologies, nanophotonic devices, optical sensors, ultrafast optics, optoelectronics, integrated optics, and biophotonics and biomedical optics. “We collaborate with all types of industries in these areas, but also in other areas where photonics can make a difference for their business and products,” Carrasco said. The institute runs major focus programs on light for health, energy and information.

In education, it offers PhD degrees in photonics, which attracts international students, while in economic development, it is proactive in establishing partnerships with industrial corporations.

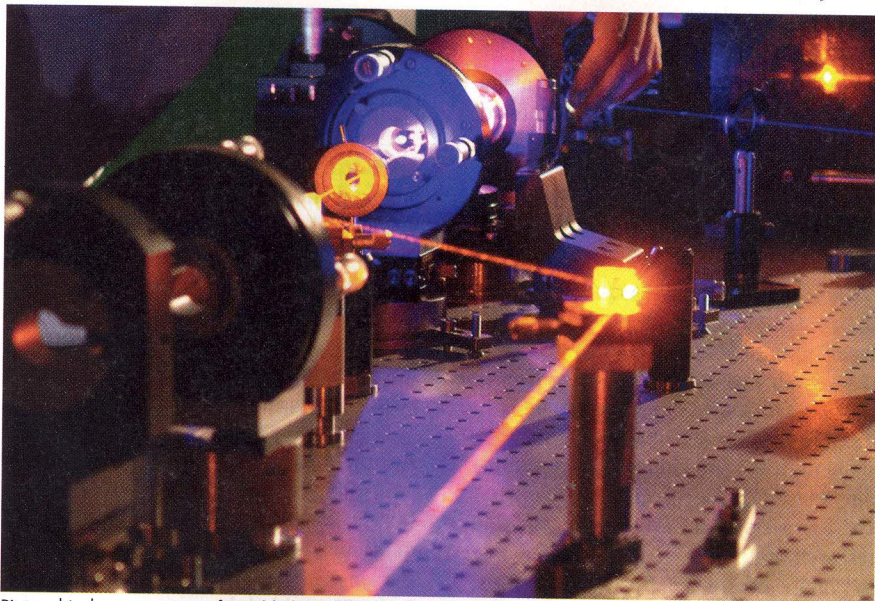
Commenting on challenges to the industry, Carrasco noted that large- and medium-size companies face difficulties that differ from those of small businesses because of the markets they tend to target. However, she added, the broad scope of photonics technology allows companies to have diversified portfolios, so, although they may suffer in one market, they may do well and even enhance sales in other segments.

When asked about projects that are nearing the commercialization phase, Carrasco noted that the institute is particularly active in patenting different types of optical sensors, nanophotonic devices and ultrathin-film technology. “Our patent portfolio includes innovations in microscopy, plasmonics, sensors for hostile environments, and transparent electrodes technology,” she said. She mentioned that their spin-off company Radiant Light commercializes optical parametric oscillators and frequency conversion devices.

ICFO expands

The institute will broaden and complete its scope with a few new areas, and it will expand its existing facilities: the Nanophotonics Fabrication Lab, the Super-Resolution Light Microscopy and Nanoscopy Lab, and the Advanced Engineering Lab. It will begin construction next fall on a building that will house a new program called Nest, which will target young talent in the field.

“The photonics industry in Spain is organized by the Spanish photonics technology platform Fotónica21, which has more than 120 members. It is the Spanish mir-



Pictured is the generation of tunable laser light at ICFO – Institute of Photonic Sciences in Spain. Photo courtesy of ICFO; photographer, Luis Montesdeoca.

ror of the European technology platform Photonics21,” Carrasco explained. She commented that the large poles of photonics activity in Spain include Barcelona, Madrid, Valencia, Zaragoza and Cantabria. Madrid and Valencia offer strong capabilities in silicon photonics, she added.

“The number of companies based in Spain that use light as a tool keeps growing, especially medium-size enterprises. We team up with all types,” Carrasco said. She mentioned the spin-off company On-Laser. The recently launched startup specializes in commercializing new laser technology for niche applications. There are also many large corporations and international companies involved in the Spanish photonics industry, she added.

New construction

“The Spanish photonics industry had been experiencing a growth rate of 18 percent before the international economic crisis, with a turnover of €1.4 billion. Even in the economic downturn, many companies continued to invest in R&D, especially small- to medium-size enterprises,” said Andrés Cifuentes, director of SECPhO, the Southern European Cluster in Photonics and Optics. “This is an excellent moment to look at Spain for photonics innovation and investment opportunities in the coming years, especially with its strong research capabilities and laboratories,” he added.

Based in Terrassa, Spain, SECPhO was

founded in April 2009 by nine companies and the research center CD6 (Research Center for Sensor, Instrument & Systems Development), which is an innovation center of the Technical University of Catalonia.

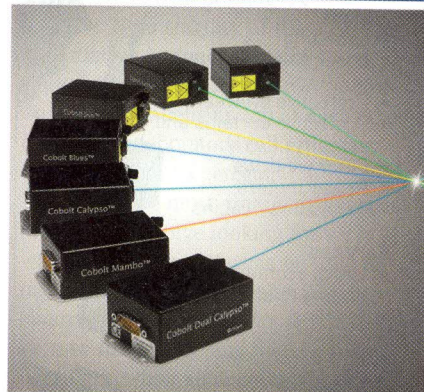
The founding members of SECPhO include laser diode manufacturer Monocrom, which holds the presidency of the cluster; Indra, a multinational company with an electro-optics business unit; Sensofar, with expertise in confocal/interferometric microscopy technology; and Easy Laser, a developer of industrial laser systems.

Currently there are more than 40 cluster members, many of which are heavily involved in research activities. The membership represents 35 percent of the current photonics industry in Spain, Cifuentes said. He added that there are many top-level research centers in the country with decades of experience.

One of the major projects in Spain is the construction of a petawatt laser facility in Salamanca, Cifuentes said. The CLPU (Center for Ultrashort Pulsed Lasers) will house the most powerful laser in Spain, he said. The CLPU is considered a scientific large-scale user facility and is funded by Spain and the European Union. It will develop ultrashort, ultraintense laser technology and promote its use and development in fields such as physics, biology, chemistry, medicine and energy. The facility will be open to international as well as Spanish users.

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Research and development

As with many other sectors, the photonics industry in Spain has to tackle a major challenge: the reduction in R&D funds for high-risk medium- to long-term research, Cifuentes said. This will have a detrimental effect on innovative product development and increase the time-to-market cycle.

He commented that the current model in Spain forces companies to take research loans, meaning less willingness to take risks and longer innovation times. The industry will take at least two years to adapt to the new conditions, but, at the same time, the situation will force companies and researchers to consider markets and end users more closely when defining research strategy.

“On the other hand, Spain has internationally recognized higher education programs in photonics, which attract talented students from around the world,” Cifuentes said.

“As surely is the case in many other countries, the photonics industry in Spain has realized that R&D must be more market-oriented than ever. Given the current global economic conditions and the national funding cutbacks, companies will have to work together to fund innovative research and engage labs and research centers in an effort to align strategy such that projects will result in value-added photonics-based technology, in shorter time – reducing the gap between research and market,” he said.

Outlook is good

The photonics industry in Spain, although still in an early stage, has experienced rapid growth in the past five years. Optical technologies can increase the value of products or manufacturing processes; in addition, nonphotonics companies are actively introducing optical and photonic solutions in their products or processes.

An interesting indicator of optics and photonics industry health is the fact that CD6 income has been growing since 2000, keeping a balance between public funding (40%) and industry contracts (60%), Jaime Castellà, managing director of CD6 said.

“Our outlook for the photonics industry in the next few years is clear: It will continue growing, pushed by market demand and supported by the Catalan and Spanish research agencies. Also, the increasing

offer of venture capital will improve the environment needed for the creation of spin-off companies that will market top-of-the-line research results.”

Castellà noted several institutions in Spain that conduct research in photonics, among them, Laboratorio de Óptica, Universidad Murcia, and the Instituto de Óptica, Consejo Superior de Investigaciones Científicas in Madrid. These two institutions, along with CD6, have long-term research programs related to vision, including programs on physiological optics and adaptive optics applied to vision, he said.

Adaptive optics

In 2008, Imagine Optic SA of Orsay, France, created a subsidiary in Barcelona to respond to growing demand from the Iberian market. Cosingo-Imagine Optic Spain SL enabled the company to identify wavefront metrology and adaptive optics customers engaged in innovative applications, including high-power lasers, astronomy and life sciences microscopy. The company distributes the Orsay-based Imagine Eyes’ research instruments for wavefront aberrometry and adaptive optics vision simulation.

Recently, Cosingo teamed up with European partners to develop an ultra-sensitive point-of-care device for early cancer diagnosis, treatment monitoring and follow-up. The project, Spedoc, of which ICFO is a partner, is based on surface plasmon resonance and microfluidic lab-on-a-chip technologies.

“In contrast to many other European countries, the Spanish photonics market is primarily led and represented through academic institutions, as its industry is not as dense as it is in some of its neighbors,” said Rafael Porcar Guezenc, business manager of the subsidiary, who added that things are changing quickly and that several organizations are working hard to counteract this situation.

“At the representative level, organizations such as SECPhO are helping photonics companies to work together and giving them the visibility they need through national exhibitions organized by and for the industry. These organizations equally help foster international growth and give them a voice at the European level. It may sound odd, but there was no such support in Spain five or 10 years ago!” Porcar said.

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