

Innovation is Fundamental for New Growth

As we all know, last year was an ordeal for the high-tech industry. Looking back at the last two quarters we can now assume that the worst is over and that recovery is slow but sustainable. Managers in the photonics industry, such as Volker Brockmeyer, Qioptiq Executive Vice President (p. 8), speak of recovering markets and business analysts agree with key players in industry about fields with great growth potential. Well-known companies within the optics and photonics industry report positive results (p. 4) and, as the association Spectaris noted (p. 27), the majority of companies in Germany predict a considerable increase in turnover this year. If we take a closer look at which fields are making money now, then hopes lie on semiconductors, medical equipment and the scientific market. In any case, innovation is a key issue: We are faced with a wave of new products that are more efficient, more stable and better suited to market demands.

In this issue, we would like to show you some of the latest achievements from both science and industry, all displaying outstanding new features. The article by Bahram Jalali, Patrick Soon-Shiong and Keisuke Goda describes a new approach to imaging called Serial-Time-Encoded Amplified Microscopy. This technology is an approach to overcome the speed and sensitivity limits of classic sensor technology (p. 32). The idea opens up new opportunities for high-throughput image acquisition in biological and industrial applications.

Our focus *Advanced Optical Components* is comprised of articles about innovations in the manufacturing of diverse components. The correct coating is certainly one of the most important features for an optical element. Much has been achieved in this respect in recent years, on page 50 we present progress in coating technology, namely in advanced plasma reactive sputtering. The next topic is precision molding. The article on page 53 describes an improved precision molding process for producing strips and arrays of mini lenses made of highly refractive glass, enabling the compact design of light sources.

This leads us to one of the main technological challenges today: How to transfer the precision of single optical devices to mass production. Lithography is not only a highly developed technology for mass production; it also allows for precise miniaturization. Nanoimprint lithography (p. 42) for the fabrication of micro lenses in CMOS image sensors is one such approach. It offers relatively low cost, resolution scalability and high pattern repeatability.

If we go from refraction to diffraction, then we can also look at gratings. The use of sub-wavelength patterns based on the effective media approach paves the way for novel grating functionalities and high-performance applications (pp. 46 and 29).

Reducing the complexity of optical systems is one further aspect to keep in mind, which emphasizes the need to increase the number of optical functions in as few modules as possible. Here, intelligent design of photonic crystal fiber technology (p. 37) allows the realization of extra functionality within the fiber, opening up the pathway for simpler, turnkey systems.

It must be remembered that – behind all such innovations – a solid basic research program is crucial for the future. Laser-based particle acceleration (p. 56) is a fascinating field of research today; let us see what applications it will enable in ten years from now.

I hope you enjoy this issue of *Optik & Photonik*.



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