Abstract Summaries

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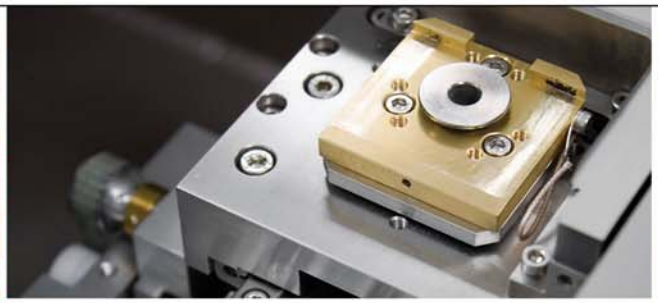


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6871-107, Session 16

Difference frequency generation based mid-infrared lasers for quantitative chemical sensing

J. J. Scherer, J. B. Paul, V. V. Ter-Mikirtychev, H. Jost, NovaWave Technologies, Inc.

NovaWave has developed several mid-IR Difference Frequency Generation (DFG) based laser systems and integrated these sources with single pass absorption cells, traditional Herriot-type multipass cells, and CRDS and ICOS cells to comprise highly quantitative mid-IR chemical sensor systems. Results will be presented that demonstrate the generality and sensitivity of the technology.

6871-108, Session 16

Femtosecond lasers for sensing in the infrared: taking advantage of the bandwidth

I. T. Sorokina, Norwegian Univ. of Science and Technology (Norway); E. Sorokin, Technische Univ. Wien (Austria); G. Guelachvili, N. Picque, Univ. Paris-Sud II (France)

The talk reviews recent advances in broadband continuous-wave, femtosecond and supercontinuum sources based on Cr^2 + and Cr^4 + -lasers, and highlights the radical efficiency and sensitivity increase when applied to high-resolution molecular spectroscopy and gas sensing.

6871-65, Session 17

High-speed micromachining with high-power picosecond ultraviolet lasers

B. Gu, GSI Group Inc.; R. Knappe, A. Nebel, Lumera Laser GmbH (Germany)

Will be submitted later

6871-66, Session 17

Picosecond laser micromachining of advanced semiconductor logic devices

B. W. Baird, J. A. Albelo, P. Y. Pirogovsky, J. N. O'Brien, Electro Scientific Industries, Inc.

Advanced semiconductor logic devices are increasingly complex, typically composed of multiple layers of dielectric, metal, and semiconductor materials. Laser micromachining is employed on these devices to form cut-outs, microvias, and perform partial material removal, including scribing and dicing operations. The recent development of high average power (> 10 W), < 20 ps, 1064 nm diode-pumped mode-locked solid state lasers operating at pulse repetition frequencies > 100 KHz enable an attractive short pulsewidth laser process alternative approach to existing nanosecond process technologies, particularly for laser micromachining of complex alloy structures. Emerging 45 and 60 nm node logic devices may contain greater than eight metal layers, typically aluminum or copper. They also may contain advanced low K layers which have proven difficult to process using existing mechanical techniques, such as dicing saws. Efficient operation at 355 nm was readily achieved using extracavity conversion by employing non-critically phase-matched LBO for SHG and critically phase-matched LBO for THG. Over 3 W at 355 nm at 100 KHz was achieved with an input of 8.5 W at 1064 nm. Preliminary micromachining results on advanced logic devices containing multiple low k and Cu layers at harmonic wavelengths (532 nm and 355 nm) yielded micromachining rates of > 300 mm/s with good workpiece quality.

6871-67, Session 17

Fiber-based high-power picosecond UV laser for microelectronics and industrial applications

M. Kauf, R. Patel, J. M. Bovatsek, W. Gries, Newport Corp.

A novel high power picosecond UV laser, based on innovative fiber amplifier technology, provides enhanced performance, higher reliability and lower cost of ownership compared to conventional technologies. This technology enables the highest commercially available power (12W at 355nm), which improves quality and throughput of existing processes and enables new applications in market segments such as semiconductor, solar cell, flat panel display and printed circuit board manufacturing.

Results will be presented for a wide range of dielectric, semiconductor, conductive and glass materials. Examples include polyimide, a dielectric material which is widely used in the semiconductor and printed circuit board industry, which was processed at high speeds with very high edge quality and no thermal damage. Transparent conductive materials, used in flat panel display and solar cell manufacturing can be processed with extreme speeds and quality far superior to results obtainable with conventional lasers.

6871-68, Session 17

Glass processing using Q-switched ns INNOSLAB lasers

K. Du, EdgeWave GmbH (Germany)

In this talk we will present a novel glass processing technique using Q-switched INNOSLAB lasers.

The mJ laser beam of some ns pulse length and beam quality of $M^2 < 1,3$ from a INNOSLAB laser is focused into the glass to a very small spot. Due to the nonlinear absorption at high intensity the laser energy is absorbed near the focus. This leads to microcracks inside glass, or localized ablation if the focus is on the glass surface. Using this mechanism, glass can be processed with high precision and speed.

6871-69, Session 17

Multiplume shielding effects in the ablation of electronic materials using high-repetition-rate UV DPSS laser

B. Naveh, B. Kling, Z. Kotler, Orbotech Ltd. (Israel)

Time resolved laser scattering and shadowgraphy were used to study multi-plume shielding effects in the interaction of a high repetition rate UV solid state laser with polymeric substrate materials prevalent in the electronics industry (e.g., mixed glass-epoxy substrates). We have studied the dependence of plume properties and shielding effect on laser pulse repetition rate, laser temporal pulse width and temporal profile at varying laser fluence near and above the ablation threshold. The dependence of ablation threshold on pulse repetition rate is also demonstrated

6871-70, Session 17

Advanced Q-switched DPSS lasers for ID-card marking

M. Hertwig, M. Paster, R. Terbrüggen, Coherent GmbH (Germany)

Increased Homeland security concerns across the world have generated a strong demand for forgery-proof ID-documents. A wide variety of these documents, including plastic ID cards, drivers' licenses and passports, are being printed using solid state laser marking processes. These marks can range from single text and barcode to high resolution greyscale images. In addition to safety features, this application requires a high quality of the marking process. This can only be accomplished by sophisticated control of scanner and laser source. In this presentation we will discuss the requirements on the Q-switched laser performance and present the implementation in a robust industrial package for 24/7 high throughput operation.