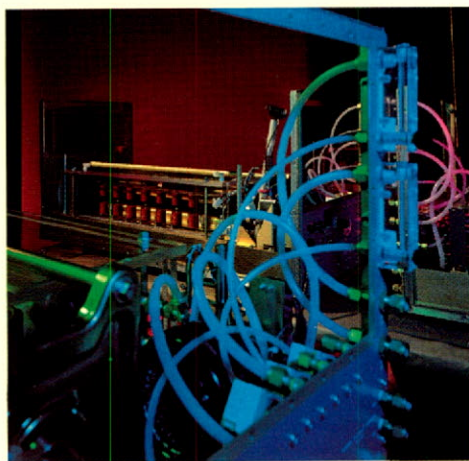


THE LUMONICS GROUP OF LASER COMPANIES

We light
make
work

we make light work

Our Focus is on Lasers



LaserMark production assembly area.

Lumonics is a group of companies that specializes in building lasers and laser systems for industry, medicine, research and development, and science. Our pulsed gas and solid-state lasers are used for numerous applications from marking electronic components, performing delicate eye surgery to welding, drilling and cutting aerospace parts to spectroscopy.

Lumonics is dedicated to staying on the leading edge of laser technology. Our lasers have a reputation for reliability, durability and exceptional quality. Our systems engineering is known for its functional, cost-effective delivery of laser benefits for specific applications. Our customer service and support network has been organized to give the quickest response possible.

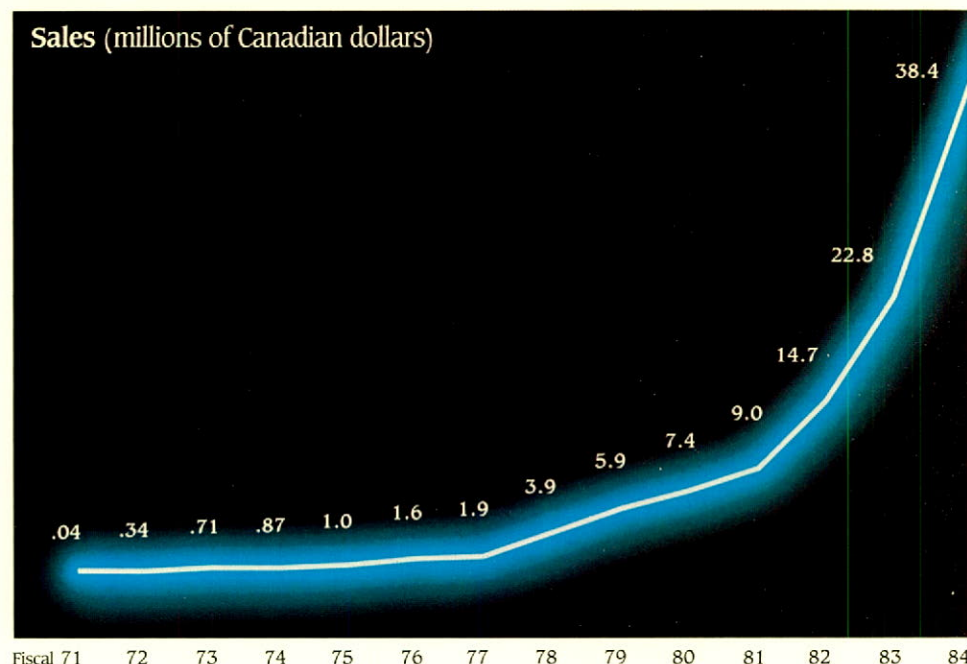
This brochure describes our unique corporate structure that encourages independent achievement while accomplishing our corporate goals. It introduces our corporate membership and explains briefly the various applications of our products and systems. Space restricts the complete presentation of all our products, facilities and capabilities. For further elaboration, you are invited to approach any of the member companies or sales offices listed on the back cover.

Over Fifteen Successful Years

Lumonics Inc. commenced operations in 1970 and is now the third largest manufacturer of commercial laser products in the world. Lumonics established an early lead in pulsed gas laser technology for scientific applications. This proven technology was used as the base for our first industrial system, LaserMark® — a projection-type, on-line, high-speed marking system. LaserMark created a new use and market for lasers and retains a solid 80% share of world sales in its category.

Lumonics is an international group with research and development, system engineering, manufacturing, marketing, sales and service functions, decentralized but coordinated worldwide. Lumonics Corporation in Arizona, Laser Identification Systems in California and JK Lasers in England are wholly-owned members of the Lumonics Group. As a group, we have the strong technological, manufacturing, marketing, financial and

Sales (millions of Canadian dollars)



management resources needed to continue our substantial growth rate. Companies joining our group generally have a record of profitable growth, a solid market position and a compatible operating style.

Lumonics is a soundly managed, public company with shares listed on the Toronto Stock Exchange. In every year of operation, we have experienced steady and significant increases in both sales and earnings.

Our International Group of Companies

The Corporate Office

Lumonics is an expanding group of independent companies with its head office in Kanata (Ottawa) at the center of Canada's high technology heartland. Each of our member companies — including the Kanata Operations — is managed by a senior executive who reports directly to the corporate CEO. Each company is encouraged to operate in an independent, entrepreneurial style while cooperating for mutual benefit on marketing activities and technology development. The Corporate Office provides member companies access to public financing, expertise in marketing, counsel on computerization, and administration and technology support.

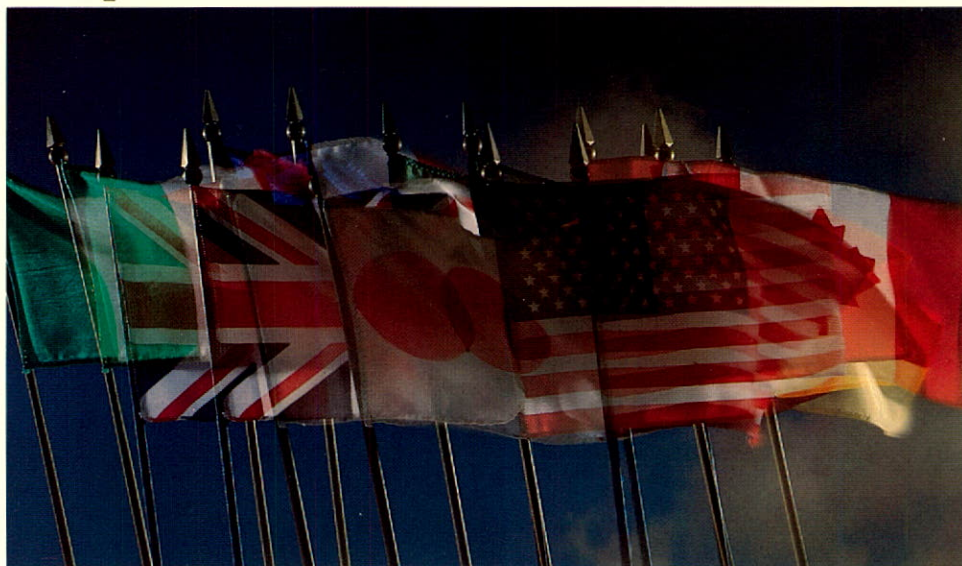
Lumonics Inc.

Lumonics Inc. is located in Kanata (Ottawa), Ontario. The company, including the Corporate Office, occupies 75,000 square feet on 11 acres of land in a company-owned facility.

As the operating arm of Lumonics Inc., it specializes in the development and manufacture of pulsed gas lasers and systems (CO₂, HF, excimer and dye) for scientific, medical and industrial marking applications.

Lumonics Corporation

Lumonics Corp. is located in a 20,000-square-foot, company-owned facility in Tempe, Arizona, a suburb of Phoenix. It offers complete turnkey laser systems, custom engineering, installation, customer training and service for the full range of Lumonics Group industrial laser systems for marking, welding, drilling and machining.



A controlled atmosphere welding system is undergoing assembly. The system incorporates a JK Laser solid-state Nd:YAG laser (foreground) for producing high quality welds in a nitrogen filled chamber (center at back of photo).

JK Lasers Limited

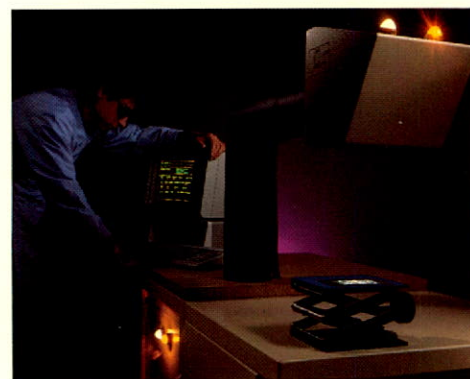
JK Lasers specializes in the development and manufacture of pulsed solid-state lasers. Considerable synergy exists between Lumonics Inc. and JK Lasers because together, they offer a very wide range of pulsed solid-state and gas laser systems for industrial, scientific and medical markets.

JK Lasers is in Rugby, England, situated 80 miles north of London. In 1984 it moved to a newly constructed 50,000-square-foot, company-owned plant, situated on 7.4 acres of land.

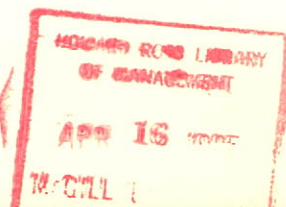
Laser Identification Systems, Inc. (LIS)

Since commencing operations in 1979, LIS has established world dominance in computer-controlled laser systems used for marking silicon wafers produced by a rapidly expanding semiconductor industry. In addition to marking wafers, LIS systems are used in general purpose marking and engraving and the company is expanding its market position.

LIS is located in a new 23,000-square-foot, company-owned building in Camarillo, California, about 35 miles northwest of Los Angeles.



LightWriter PC is a turnkey system for marking, among other things, printed circuit boards and metal products. The operator enters the marking parameters which produce a mark on aluminum (foreground).



our broad spectrum of lasers

Marking and Coding Systems

The use of lasers for marking is accelerating because lasers deliver a reliable, cost-effective improvement over traditional ink-based marking systems. Our systems produce clear, non-contact, permanent marks at high speeds on flat, curved, and irregular surfaces. Our customers enjoy freedom from messy inks, high reliability, low operating costs, self-diagnostics and automatic, unattended operation. These are some of the many reasons why there are more than 1,500 Lumonics laser-based marking systems in use worldwide.

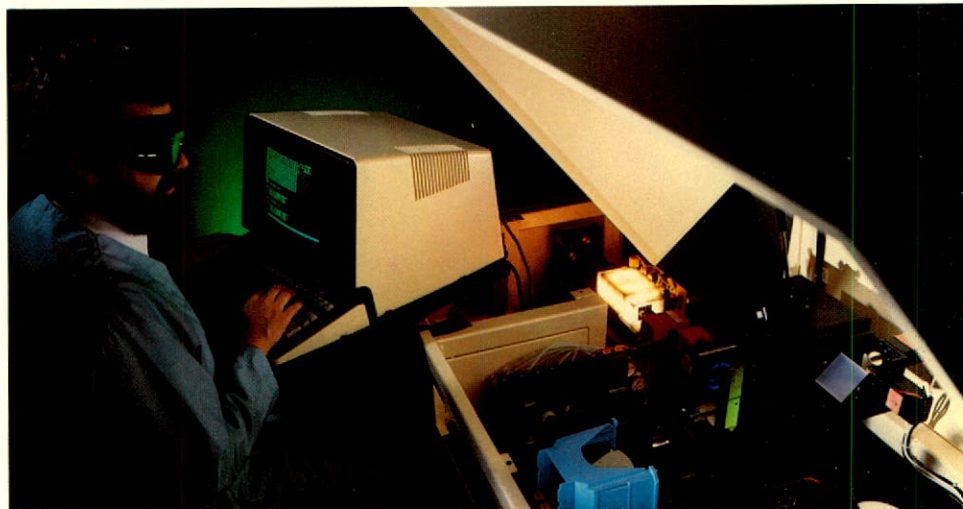
Some current applications include the date and lot coding of products and packages, part number identification, bar coding and serialization of automotive and electrical components, code dating for the beverage industry, and the marking of passive and semiconductor electronic components.

Our systems are installed on many types of production, conveying, packaging and labelling machines. They are also integrated with parts handling, test handling and automation equipment.

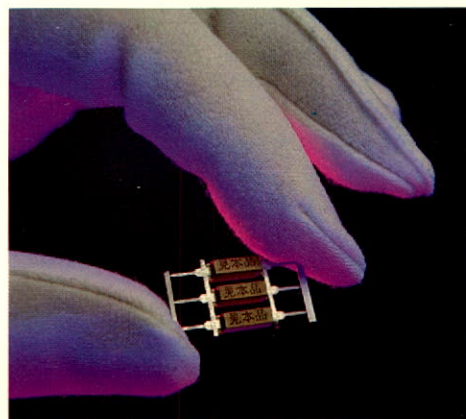


Top: A selection of the many packaged goods that are now date and batch coded with LaserMark. Permanency, mark quality and marking efficiency have made LaserMark an industry leader.

Above: Product marked with bar code produced by our typewriter laser system. It is expected that programmable bar codes will become a standard in the pharmaceutical industry.



Above: Technician puts a WaferMark 345 system through its final predelivery tests. The blue cassettes contain silicon wafers which the system marks.



Left: Codes applied to electronic components using LaserMark. LaserMark can produce multi-lingual marks, logos, alphanumerics and bar codes.

LaserMark

This CO₂ system, manufactured by our Kanata facility, can operate at very high speeds because of our unique light projection technique. Marks are made by single instantaneous laser pulses repeated in rapid succession. LaserMark is used extensively to apply expiry or "best before" dates on supermarket items and to mark electronic components with identifying and final-tested values. Over 1,300 LaserMark systems are in use daily around the world.

WaferMark™

This is a YAG laser-based system made by Lumonics' California subsidiary, Laser Identification Systems, Inc. (LIS). WaferMark works by rapidly steering the focused laser beam with digitally controlled mirrors, thereby "writing" the required mark. The laser used has been optimized to mark semiconductor

materials without damaging them. WaferMark, a proprietary LIS system, has captured about 90% of this growing market.

LightWriter™ PC

This is also a product of LIS which operates similarly to WaferMark, except the laser is optimized for marking bare metals and plastics. Various applications are being developed for industries that manufacture precision metal parts, where a high degree of quality control and mark permanence are necessary.



Actual time exposure of a LightWriter PC system marking aluminum. LightWriter PC's computer-controlled optics steer the laser beam to make it "write" its own name.

Materials Processing Systems

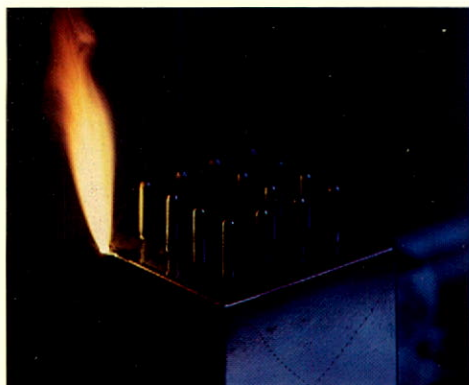
JK Lasers Limited manufactures lasers and complete industrial systems for materials processing. Based upon pulsed solid-state laser technology, these systems have many advanced features unique to JK products:

- all laser parameters can be fully controlled by computer software to provide total automation of the production process;
- a patented solid-state power supply permits the precise time profile of the welding pulse to be tailored to a degree that makes otherwise impossible welds routine;
- advanced technology in laser head design produces highly efficient operation, leading to lower operating and maintenance costs and long-term reliability; and
- sophisticated, computer-controlled systems are integrated with standard workhandling modules to provide user-friendly machining centers tailored to precise customer needs.

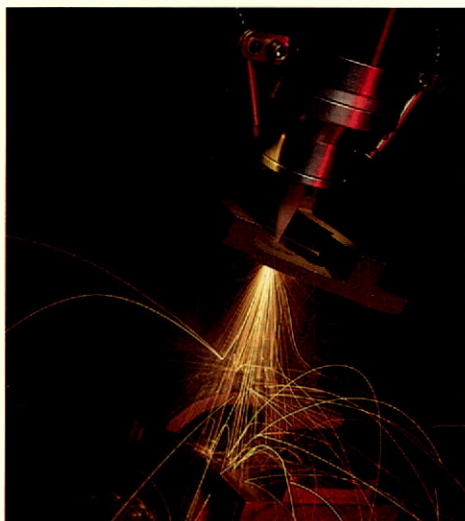
These features have made JK Lasers a leader in materials processing. Hundreds of our pulsed YAG laser systems are in use around the world.

Welding

Laser welding with our systems offers a precision not achievable with conventional spot and seam welding techniques. Thin sections and dissimilar materials can be welded without fillers. Awkward shapes can be welded in a



Concentrated laser energy speeds welding processes while minimizing heat affected zones.



JK laser in an industrial application performing a precision cutting operation.

variety of atmospheres including radioactive and vacuum environments. Expensive post-weld finishing is reduced and damage to delicate products due to heat transfer is virtually eliminated with our lasers.

Drilling

Lasers can drill holes in extremely hard materials at oblique entrance angles in irregular and curved surfaces. They can accomplish this with precision and at production rates not possible using conventional drilling techniques. Computer numerical control of laser and workpiece handling permits very complex, high-speed drilling rates with assured repeatability and instantaneous software re-tooling.

Cutting

Laser cutting permits an infinite variety of shapes to be cut in most metals and some plastic materials. Brittle, fragile and extremely hard workpieces may also be cut with pulsed lasers. Narrow kerf width, sharp edges, and clean surface finish are all possible using JK lasers. Computer control also provides great flexibility for limited run production and for use in the prototype phases of product development.

Holography

JK Lasers manufactures a range of pulsed lasers for holography. The short duration of the laser pulse effectively freezes any motion present during the exposure and makes it possible to take holograms without the complex vibration-isolating structures associated with continuous-wave holography. More importantly, it provides a coherent "snapshot" of objects that may be vibrating, flexing or moving rapidly. Superimposing two such exposures on a single holographic plate results in a pattern of interference fringes appearing on the hologram, where the shape of individual fringes can be mathematically related to changes in the shape of the object between the exposures. Displacements as small as a few millionths of an inch are easily detected.

This technique, called holographic interferometry, provides a powerful analytical tool to engineers evaluating the performance of structures that are subjected to vibration or to mechanical or thermal stress. It is used to detect incipient weaknesses in components during the design phase and to study fatigue, wear and corrosion during operating life. By analyzing vibrational modes, engineers can isolate and eliminate sources of noise in complex mechanical structures like automobiles. Holographic interferometry is also used in the aircraft and aerospace industries to inspect assemblies in which 100% integrity is essential.



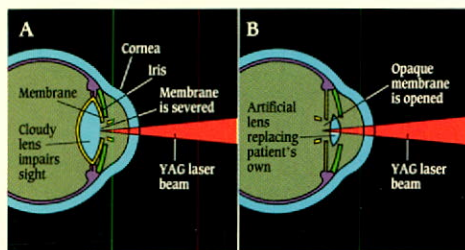
Dark interference fringes on this double pulse hologram show vibrational movement of the guitar soundboard. Holographic interferometry can be used in a similar way to analyze vibration in engineering structures.

our broad spectrum of lasers

Medical Systems

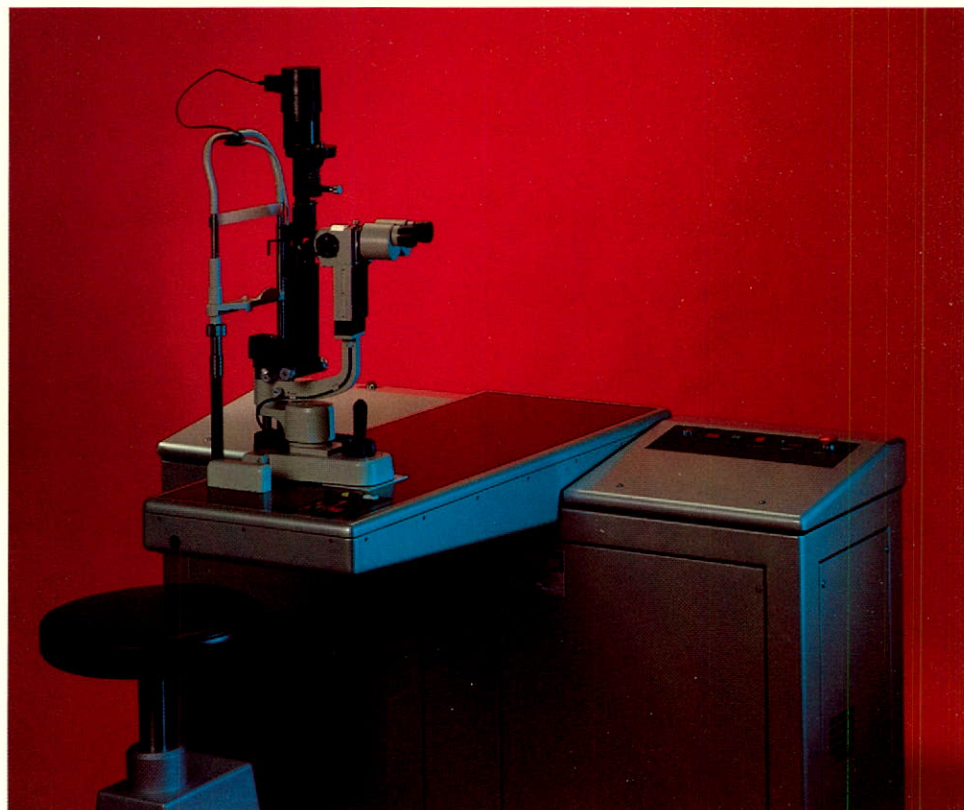
Ophthalmology

In 1983, Lumonics introduced a special laser system for carrying out delicate surgery on the human eye. The system incorporates a JK Lasers Nd:YAG laser for doing the actual surgery, and a small, low-power visible aiming laser.



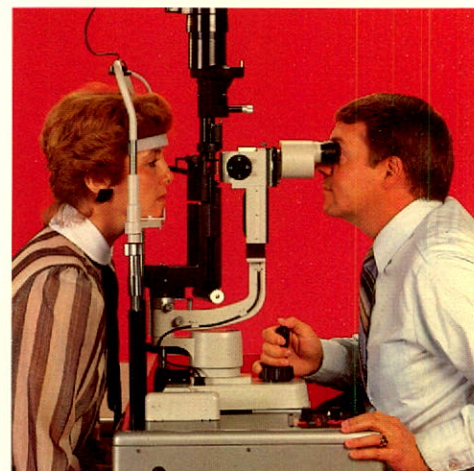
YAG lasers can be used at two stages in cataract surgery: firstly, (A) to sever membranes in front of a cloudy eye lens allowing removal and implantation of an artificial lens; secondly, (B) to sever membranes behind the new lens that often become opaque after cataract surgery. This last operation can be performed in a matter of minutes, replacing delicate surgery that once took up to four hours.

The system is designed specifically for the removal of secondary cataracts, cloudy membranes that can form behind artificial lenses. Artificial lenses are implanted to correct primary cataracts, a clouding of the natural lens of the eye. The laser concentrates light energy into very short intense pulses that make tiny $1/10\text{mm}$ cuts. The light passes through the lens of the eye without damaging it.



This technique takes what was once a lengthy operation and reduces it to an outpatient procedure that can be performed in minutes without anaesthetic.

Lumonics foresees involvement in the development of other laser systems for medical use, particularly those for ophthalmic surgery.



Top: The Lumonics solid-state laser system for ophthalmological surgery, developed in cooperation with Medical Lasers, Inc.

Above: A posed demonstration showing typical treatment using the ophthalmological laser system.

Left: Ophthalmological surgery systems receiving final quality checks in Kanata.



Scientific Products

The earliest products of Lumonics (pulsed infrared CO₂ gas lasers) and JK Lasers (pulsed visible and near-infrared, solid-state systems) were created for research scientists in universities and other laboratories throughout the world, a market that continues to represent an important and technically challenging part of our total business. Applications of these products include plasma studies, spectroscopy, atmospheric probing and photochemistry. The state-of-the-art technology developed for these research-oriented products forms the basis of our current marking, materials processing and medical laser systems.

Excimer lasers, which are based on technology similar to CO₂ lasers but which emit in the ultraviolet region of the spectrum, were developed by Lumonics in the late 1970s and now represent the major line of scientific products for the company. In addition to continued application in basic research (especially spectroscopy and photochemistry), markets for excimer lasers are being developed for the semiconductor manufacturing industry and for medicine. Lumonics has introduced excimer lasers with sophisticated, user-friendly controls that satisfy the requirements of

customers in these fields. Sales have been made to major semiconductor manufacturers and equipment houses in North America, Japan and Europe.

Lumonics is also active in pulsed dye lasers, which are used in combination with excimer and Nd:YAG devices to generate tunable light in the visible spectrum. Our dye lasers play an active role in many areas of fundamental research.

Semiconductor Processing

Potential application of excimer lasers in the semiconductor manufacturing industry include:

- lithography – the exposure of photoresist by ultraviolet light to generate the elements of the integrated circuit;
- laser-assisted chemical vapor deposition – the deposition of various metallic and insulating layers by photochemical processes; and
- etching and direct writing – the micro-machining of direct tracks into the various layers on a wafer.

In all cases, the purpose of employing lasers is to achieve higher throughput, better resolution/packing density, and higher yields.



A Lumonics Excimer laser in use by Doctor Paul Corkum at the National Research Council, Ottawa, as an amplifier for ultra-short picosecond pulses.

Photochemistry

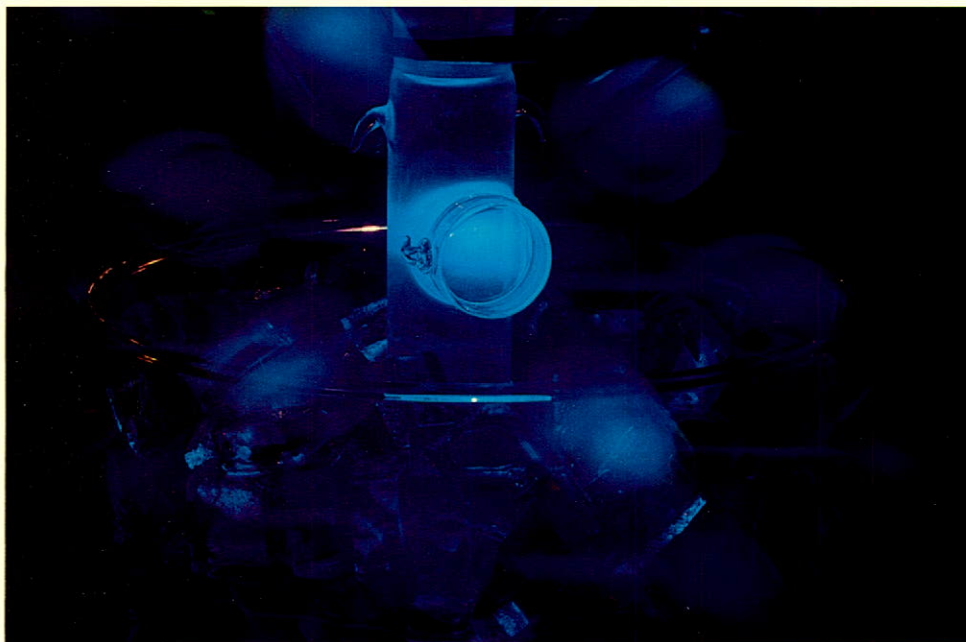
Various Lumonics and JK scientific products are used in the study and control of chemical reactions by light (normally laser light). Practical examples include Vitamin D synthesis, vinyl chloride polymerization and the separation of rare isotopes, such as deuterium/tritium and some fissile materials.

Spectroscopy

Since different atoms and molecules absorb and emit radiation at certain characteristic wavelengths, tunable lasers such as dye and CO₂ devices may be used as sensitive probes of the chemical composition of a material. The detection of pollutants and trace elements in the atmosphere is a good application for laser spectroscopy.

Plasma Studies

Plasma is the state in which material exists at extremely high temperatures, for example, during an electrical discharge in a gas. Research on this state is important for controlled nuclear fusion applications. Lumonics CO₂ lasers and JK solid-state systems can be used to both initiate and study plasmas.



Left: Previtamin D synthesis through laser photochemistry: a Lumonics laser illuminates a reaction vessel cooled with ice. Special filters create multiple images of the resulting fluorescence.

Worldwide Customer Sales Service and Support

The marketing staffs of our member companies are technical professionals who routinely analyze customer problems or designs and recommend total laser-based systems configured to satisfy particular needs. Our systems are delivered and installed by Lumonics staff and fully commissioned on site. Customer operating and maintenance personnel are then fully trained.

To ensure trouble-free operation and maintenance by the user, Lumonics provides built-in diagnostics and places great emphasis on the quality and completeness of all instruction manuals and other supporting documentation. The training and documentation make smooth transition to owner operation the norm.

Our worldwide service organization and spare parts depots assure our customers that any problems that do arise are resolved quickly by Lumonics field service staff.

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**LUMONICS**