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Industrial Crystals

US Industry Study with Forecasts for **2011 & 2016**

Study #2166 | May 2007 | \$4500 | 223 pages

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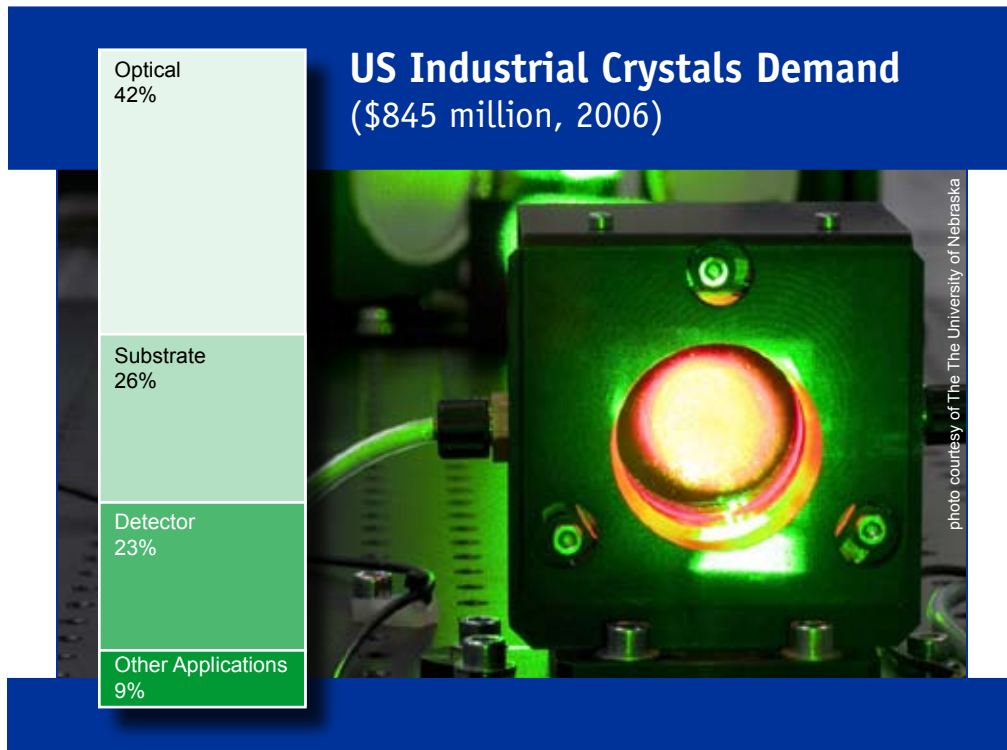
Key growth drivers for US industrial crystals include strong demand for nonlinear optical materials and compound semiconductor substrates in the communications equipment market.

US industrial crystal demand to grow 5.8% annually through 2011

The US market for industrial crystals, excluding silicon, will advance nearly six percent per year through 2011 and surpass \$1.1 billion. Growth will be driven in large part by strong demand for nonlinear optical materials and compound semiconductor substrates in the communications equipment market. Also experiencing strong gains will be the security and defense, and medical markets where technological advances will create new opportunities for growth. Though still healthy, more moderate gains will be experienced in areas such as transportation, scientific instruments, and industrial machinery.

Communications, security and defense to offer best market opportunities

In the wireline communications market, greater bandwidth demand will result in the extension of fiber optic data networks closer to the end-user, and force communications companies to upgrade their networks to advanced 40 and 100 gigabit-per-second technology. This in turn will drive nonlinear optical, laser and substrate crystal demand in this market. Additionally, in the wireless communication market, the wide-scale deployment of third and fourth generation mobile communication platforms in developed countries, along with the roll out of a long range, high bandwidth wireless data



network technology known as WiMAX, will drive demand for power amplifiers built on compound semiconductor substrates. While the largest gains will occur in the communications market, slightly faster growth will be realized in the security and defense market. Security and defense funding in the US will continue to grow at a strong pace due to persistent fears of global terrorism (particularly targeted at US interests), and to ongoing US involvement in the Middle East.

Substrates, detectors to be fastest growing applications

Besides the expanding wireless market, strong growth in substrate application

demand will also occur due to the rapidly growing solar energy market, and the expanding use of light emitting diodes (LEDs) in motor vehicles, as backlights in flat screen monitors and televisions, and in general lighting applications. Growth in detector applications will stem largely from increased demand for advanced medical imaging instruments, though growth will also be realized in the security and defense market, and the oil, gas and mining industry. Timing applications, in contrast, will experience weakness as production of consumer mobile communication and wireless network electronics continues to shift toward Asia, and new technologies such as MEMS provide increased competition.

Sample Text, Table & Chart

APPLICATIONS

Optical

Demand for industrial crystals in optical applications will reach \$1.8 billion in 2011. Advances will be led by laser crystal demand, particularly for the production of high-power lasers. This demand will also drive demand for transmission gratings, lithium niobate, the most utilized NLO crystal in lasers will also expand strongly in optical applications. Instruments and components will continue to expand at healthy paces.

Crystals, particularly those that have been shaped in the proper manner, have long been admired in nonindustrial applications because of how beautiful they appear when irradiated with light. The intrinsic order within a crystal bends and reflects the light, producing a brilliant effect when viewed by an observer. Thus it is not surprising that, given the inherent ability of crystals to interact with and affect different wavelengths of light, optical applications should account for the largest share of industrial crystal demand. In 2006 the various optical applications of industrial crystals, including nonlinear optics (NLO), instrument components, laser crystals and others, constituted 42 percent of the US industrial crystal market.

The majority of optical crystal demand is concentrated in nonlinear optics, due to the high value-added nature of these materials. NLO crystals not only allow lasers to operate at wavelengths that would otherwise be unobtainable, but they also facilitate advanced optical waveguide, rotator and isolator functions in fiber optic communication networks. Instrument optics covers a wide variety of optical uses of crystals including windows, lenses, prisms, beam splitters, filters, etc. in analytical instruments, but also industrial equipment. Laser crystal demand, in contrast, is much more specific and refers to the crystals that produce the stimulated emission. Finally, the remaining

85

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TABLE IV-1

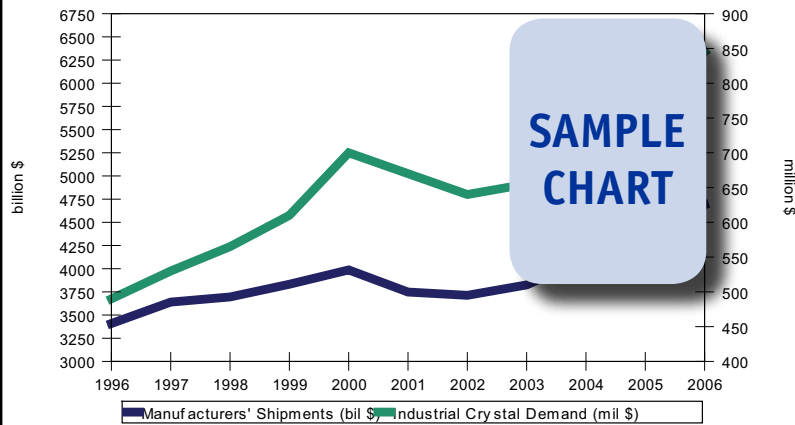
INDUSTRIAL CRYSTAL DEMAND BY MATERIAL
(million dollars)

Item	1996	2001	2006	2011	2016
Manufacturers' Shipments (bil \$)	3,850	4,200	4,500	4,800	5,100
\$ crystals/000\$ manufacturing	24	25	26	27	28
Industrial Crystal Demand	100	110	120	130	140
Transition Metal Oxides	95	100	105	110	115
Semiconducting	65	70	75	80	85
Alkaline & Alkaline Earth Halides	15	16	17	18	19
Sapphire	25	26	27	28	29
Quartz	30	31	32	33	34
Other Materials	70	75	80	85	90

SAMPLE TABLE

TABLE II-1

INDUSTRIAL CRYSTAL MARKET, 1996 - 2006



SAMPLE CHART

Sample Profile, Table & Forecast

COMPANY PROFILES

Cree Incorporated

4600 Silicon Drive
 Durham, NC
 919-313-3300
<http://www.cree.com>

Revenue
 US Revenue
 Employees

Key Products: compound semiconductor wafers

Cree is a leading developer and manufacturer of semiconductor materials and devices based on silicon carbide (SiC), gallium nitride (GaN) and related compounds. The Company's products include light emitting diodes, power switching devices, radio frequency devices and near-ultraviolet lasers.

Cree held the fourth largest share of the US industrial crystal market in 2006. The Company is involved in the production of industrial crystals as a vertically integrated manufacturer of semiconductor devices, with operations that include bulk SiC crystal growth, wafering, polishing, epitaxial deposition and fabrication. In addition, Cree synthesizes a range of GaN crystal substrates, based on a hydride vapor phase epitaxy (HVPE) method and seeded boules HVPE growth process. In FY 2006, wafer products accounted for five percent, or approximately \$20 million, of Cree's total revenues.

Compound semiconductor materials produced by the Company include SiC and GaN wafers and epitaxy products. In general, Cree's wafers are marketed for use in the research and manufacturing of light

**SAMPLE
 PROFILE**

TABLE VI-7

MEDICAL EQUIPMENT MARKET FOR INDUSTRIAL CRYSTALS (million dollars)

Item	1996	2001	2006	2011	2016
Electromedical Equip Shpts (bil \$)	10.6	10.5	10.1	10.0	12.0
\$ crystals/000\$ equipment	0.000	0.000	0.000	0.000	0.000
Medical Equipment Crystal Demand	0.000	0.000	0.000	0.000	0.000
By Type:					
Imaging	0.000	0.000	0.000	0.000	0.000
Surgical & Other	0.000	0.000	0.000	0.000	0.000
By Application:					
Optical	0.000	0.000	0.000	0.000	0.000
Detectors	0.000	0.000	0.000	0.000	0.000
Other	0.000	0.000	0.000	0.000	0.000
% medical	0.000	0.000	0.000	0.000	0.000
Industrial Crystal Demand	490	670	845	1120	1400

**SAMPLE
 TABLE**

"Crystal Demand: Medical Equipment

Demand for industrial crystals used in medical equipment will grow 5.7 percent per year to \$185 million in 2011. The pace of growth will moderate from the 2001 to 2006 pace, reflecting a corresponding slowdown in the electromedical equipment industry. Imaging equipment will continue to account for the largest portion of crystal demand due to the importance of crystals in medical imaging detectors, though applications in surgical and other equipment will also experience strong gains."

--Section VI, pg. 132

OTHER STUDIES

Advanced Lighting

This study analyzes the US market for advanced lighting. It presents historical demand data (1996, 2001 and 2006) and forecasts to 2011 and 2016 by product (e.g., compact fluorescent lamps, light-emitting diodes, high-intensity discharge, etc.) by market (e.g., construction, motor vehicles, signage, consumer electronics). The study also analyzes economic and regulatory trends, details industry composition and merger and acquisition activity, evaluates company market share and profiles leading manufacturers.

#2197 06/2007..... \$4400

Advanced Ceramics

US advanced ceramics demand will grow 7% annually through 2010. Electronic components and electrical equipment will remain dominant but mature markets. The best opportunities for ceramics include ballistic armor, ceramic composite automotive brakes, diesel particulate filters, joint replacement products and piezoceramic sensors. This study analyzes the \$8.6 billion US advanced ceramics industry to 2010 and 2015 by type, product and market. It also details company market share and profiles major producers.

#2134 12/2006..... \$4400

Insulated Wire & Cable

US demand for insulated wire and cable will grow 2.2% annually through 2010. Fiber optic cable will see the sharpest gains, followed by electronic wire and cable. Electronic equipment will be the fastest growing market as the communications and computer industries recover from their collapse early in the decade. This study analyzes the \$18.4 billion US insulated wire and cable industry to 2010 and 2015 by material, product and market. It also evaluates company market share and profiles major players.

#2093 09/2006..... \$4400

Advanced Flat Glass

US demand for advanced flat glass will rise 5.9% annually through 2010. Growth factors include the emergence of smart glass and other technologies and strong gains in protective laminated glass. The best prospects are for solar control flat glass and other advanced flat glass products (e.g., heads-up display windscreens, self-cleaning glass). This study analyzes the \$5.8 billion US advanced flat glass industry to 2010 and 2015 by product and market. It also evaluates market share and profiles major players.

#2074 08/2006..... \$4200

Sensors

US demand for sensors, transducers and associated housings will reach \$12.1 billion in 2010. Gains will be based on an improved outlook for motor vehicles and other sensor-containing products. Best prospects include advanced proximity and positioning sensors, optical chemical sensors, CMOS and thermal imaging sensors, and advanced physical property sensors. This study analyzes the US sensor industry to 2010 and 2015 by product and market. It also profiles major players and evaluates producer market share.

#2053 05/2006..... \$4200

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