Research Overview

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Nanotechnology Investment Thesis

iNano Capital Markets believes that nanotechnology represents one of the greatest opportunities of our time, both in terms of economic development and human advancement. In its current, widely accepted definition—functional applications of technology enabled by the manipulation of matter at a scale smaller than 100nm—the field encompasses a range of applications linked by our newfound ability to visualize and control at the sub-microscopic level. Since the inception of the U.S. National Nanotechnology Initiative in 2001, more than $8.3 billion in federal funding has gone into basic research, and the technology has already begun the transition from "lab to fab." Products enabled by nanotechnology are being released on a near-daily basis, but development in the field is sure to be a multi-decade phenomenon, with the eventual goal of atomically precise, bottom-up manufacturing.

The National Science Foundation has predicted that, by 2015, nanotechnology will impact more than $1 trillion in products, with other groups pegging the number even higher. While this figure is greater than the revenue that will be realized by the nanotech companies directly, it indicates the incredible breadth and depth of the impact that this technology will have on our economy. Nanomaterials are currently driving evolutionary performance enhancements in everything from textiles, to sporting goods, to cosmetics, to food, to automobiles. More revolutionary applications are beginning to emerge in the fields of healthcare and electronics. Nanoscale innovations are also helping bring the promise of alternative energy, clean technologies and personalized medicine closer to reality.

The economic potential is immense, but as with any new technology, there are significant risks that must be navigated as well. The intellectual property land grab that has intensified in recent years has created a thicket of overlapping patents. Certain application areas feature multiple technology platforms competing for a single market, and start-up failure rates will be relatively high. Nanoparticle toxicity concerns have generated headlines and must be monitored by investors, though the actual risks will likely be constrained to certain application areas.

This combination of incredible opportunity and substantial risk requires unique insight into the intellectual property, business models, and how a company's disruptive technology platform might fit within the context of existing industry structures. iNano Capital Advisors fills this need with a multi-faceted research offering that comprises fundamental as well as quantitative methodologies, supported by a proprietary expert network, The Shore Council on Nanotechnology. These qualities make iNano a critical partner for any investors seeking to interpret the opportunities and risks to their portfolios presented by the commercialization of nanotechnology.

Primary Segments of Commercial Nanotechnology Today

Materials

Bulk materials exhibit different, potentially advantageous qualities when reduced to nanoscale dimensions. Optical properties, thermal and electrical conductivity, hardness, and strength can in many cases be controlled by altering a material's molecular structure. As an illustration, consider two of the naturally occurring forms of carbon: graphite and diamond. Graphite is a soft, opaque, electrically conductive, dark-colored substance used as pencil "lead", and as a dry lubricant. Diamond is an electrical insulator, the hardest material in nature, and is translucent. The sole compositional distinction between these materials is the nanoscale crystalline structure of the carbon atoms.

Nanoparticles often are dispersed in relatively small proportions within a bulk matrix to improve the properties of the whole. These may include polymer composites, alloys, sunscreens/cosmetics, and chemicals. The materials segment will be responsible for the most far-reaching impacts of nanotech, as any manufactured product can be improved by optimization of the materials from which it is constructed.

Electronics and Devices

The electronics industry is arguably the strongest driver of nanotech commercialization today. Quite simply, the future of the semiconductor industry is dependant upon nanoscale innovation. Processing speeds and data storage densities have maintained a course of constant improvement by further miniaturization of their features, known as Moore's Law. Current state-of-the-art processors from Intel and AMD utilize 65 nanometer (nm) architectures, which push the envelope of optical lithography patterning, the precision of which is governed by the wavelength of light. Novel patterning techniques, such as nano-imprint lithography, are now being developed to overcome this limitation.

Beyond silicon, companies such as IBM are investigating the use of individual single-walled carbon nanotubes as transistors. In the more distant future, we may see the emergence of quantum computing, which could solve complex problems beyond the scope of even the most powerful supercomputers. Outside of the semiconductor and data storage space, nanotechnology is poised to have a significant impact on display, networking, sensors, RFID, and consumer electronics.

Biomedical

The convergence of nanotech and biotech is logical, as many biologic units such as DNA, and some viruses and bacteria, are nanoscale. This allows nanostructures to interact with sub-cellular machinery in unique ways, and likewise leads to the reverse-engineering of biological processes for applications in materials and electronics. Therapeutic compounds can benefit from nano-structured delivery platforms that control release or target specific cells within the body. Likewise, diagnostic systems can be made much more sensitive and accurate. Both of these components are under intense research and development for the treatment and monitoring of cancer, and actively supported by programs of the National Cancer Institute.

Genetics and stem cell research, tissue engineering, drug discovery, and implantable medical devices are all being improved and advanced by the application of nanotechnology. Such applications have profound implications for improving quality of life and relieving human suffering.

Tools

The ability to see, measure and manipulate at the nanoscale is dependant upon advanced tools. These are often referred to as the "picks and shovels" of the nanotechnology "gold rush," encompassing electron and atomic force microscopes, highly sensitive electronic, chemical and mechanical testing equipment, as well as molecular modeling and simulation and informatics software. Providers of these tools have benefited greatly from the increased government and private investment in nanotech research, producing some of the field's biggest commercial successes to date.

Business Models

Start-up Operating Company

These are small firms that are in the process of late-stage technology development and scale-up to commercial production. They may be pursuing a single product line, multiple products within a given industry, or a platform technology with applications in multiple industries. Because these companies often go public before reaching cashflow breakeven, managing the burn rate while achieving identified milestones is critical.

Established Operating Company

Companies that have a relatively lengthy, typically profitable operating history may look to nanotechnology either to drive growth (offensive) or to protect existing markets from encroachment by new competitors (defensive). Companies with significant R&D resources may develop nanotechnologies in-house, but most often established operating companies are better suited to license or acquire from a start-up.

Technology Developer

A common business model for biotech companies, technology developers have no manufacturing or distribution infrastructure. Intellectual property is their product, and it may be generated internally, but is more often licensed from a university, government lab or corporation. The technology is developed more fully for commercial use and then sold or out-licensed to an operating company, often as a suite of complementary patents.

Holding / Investment Company

Companies in this segment include those which fund early-stage university research in return for commercialization rights, those with multiple, autonomous wholly or majority-owned operating subsidiaries, and those which provide venture capital to a broad portfolio of companies. The fewer companies and/or technologies in the portfolio, the greater influence that changes in the outlook for any one holding will have on the parent company's share price. For holding/investment companies, growth is typically achieved through capital gains realized when a portfolio company experiences a liquidity event such as an IPO or acquisition.

Our Research

Fundamental Research on Pure Play Nanotech Companies

Fundamental equity research in the conventional format will be provided on the universe of pure-play nanotech companies, which at present constitutes a relatively small group. Each of these reports will focus on a single company and will feature a comprehensive analysis of underlying technology and IP, market penetration and growth strategy, management, and financial condition, and will include a rating and price target. These reports will be updated at least quarterly following the earnings release.

Theme-focused Research Utilizing Quantitative Ratings

We also will offer unique reports that explore an area of nanotechnology development as it is applied within a certain industry segment, e.g. ceramic nanoparticles as a filler for polymers, or dendrimers for targeted delivery of anti-cancer compounds within the body. These reports will begin with an in-depth look at the underlying technology, including the timeline of its development, the IP environment, and an identification of potential hurdles on the path to commercial scale-up. Specific applications of that technology within the topic industry are then discussed, as are the companies involved in the theme/industry, from private start-ups to multinationals. This analysis incorporates the results of surveys and interviews conducted with members of The Shore Council on Nanotechnology, our proprietary network of nanotech experts from industry and academia. Finally, these reports will include profiles on the public companies mentioned in the body of the report, including ratings based on a proven quantitative model.

Customized Research

Tailored to the client's individual portfolio or investment strategy, we are able to provide periodic reports on themes, application areas or companies of interest. Employing extensive databases of worldwide patenting and scientific publishing activity in nanotechnology, we utilize these leading indicators to help our financial or industrial clients best position themselves as trends unfold.

Weekly Review of Critical Developments in Nanotech

Distributed electronically each Friday morning, this short piece will comprise the week's important developments in the world of nanotechnology. Major announcements from companies, important breakthroughs in basic nanoscience research, and government funding and regulatory developments will be summarized with links provided to more in-depth content. We will also list any changes in our research coverage and preview upcoming conferences and events.

Coverage Universe

Pure Play Coverage Universe

These companies will figure prominently in all of our research reports, and will be the primary subjects of our individual company coverage.

Pure Play Coverage Universe			
Materials			
Company	Symbol	Recent Share Price	Market Cap (MM)
Altair Nanotechnologies	ALTI	$4.00	$281.6
Luna Innovations	LUNA	$6.59	$68.4
Nanophase Technologies	NANX	$3.09	$65.1
Shengdatech	SDTH	$12.82	$693.5
Symyx Technologies	SMMX	$7.16	$239.6
Electronics and Devices			
Company	Symbol	Recent Share Price	Market Cap (MM)
Kopin	KOPN	$3.05	$207.0
Lumera	LMRA	$2.23	$44.7
Nano-Proprietary	NNPP	$1.04	$111.5
NVE Corp.	NVEC	$23.33	$108.1
Universal Display	PANL	$18.34	$646.8
Biomedical			
Company	Symbol	Recent Share Price	Market Cap (MM)
BioSante Pharma.	BPAX	$3.75	$207.0
CombiMatrix	CBMX	$7.15	$42.8
Flamel Technologies	FLML	$9.82	$235.6
Immunicon	IMMC	$0.82	$22.8
Nucryst Pharma.	NCST	$1.41	$26.1
Nanogen	NGEN	$0.32	$23.4
Nanoshpere	NSPH	$13.77	$305.4
Novavax	NVAX	$3.09	$191.6
SkyePharma	SKYE	$2.80	$228.2
Tools			
Company	Symbol	Recent Share Price	Market Cap (MM)
Accelrys	ACCL	$7.19	$191.9
FEI Co.	FEIC	$21.30	$772.9
Keithley Instruments	KEI	$8.74	$142.2
Veeco	VECO	$12.97	$412.0
Holding Co. / VCs			
Company	Symbol	Recent Share Price	Market Cap (MM)
Arrowhead Research	ARWR	$3.38	$130.5
Harris & Harris	TINY	$8.35	$194.6

Broad Impact Coverage Universe

These companies are too large and/or diverse in focus to be considered "nanotech companies" per se, but may have significant internal initiatives or partnerships related to nanotechnology. Many of the more prolific companies, such as IBM and GE, are active in more than one nanotech segment.

Broad Impact Coverage Universe						
Materials		Electronics and Devices		Biomedical	Tools	
AA	IBM	ABB	IRSN	ABBI	A	NEWP
AAAGY	ISON	ADSX	ITT	ACL	AEIS	NVLS
ABB	KMB	AFOP	JDSU	ACUS	AMAT	NVMI
ACO	LRLCY	AMAT	LMT	BAX	AME	PHG
AIN	LYO	AMD	LPL	BDSI	AMKR	PKI
AKZOY	MAS	AMKR	LSI	BMY	ANSS	PLAB
AMSC	MC	CAJ	MC	BSX	ARXX	SNPS
APD	MITSY	CAMD	MCHP	CGPI	ASML	TOSBF
ARJ	MM	COHR	MMM	ELGX	ASYS	
AVY	MMM	CREE	MOT	ELN	AVZA	
BAY	MON	CSCO	MSBHY	ENMD	BEC	
BF	MOT	CY	MXWL	GE	BRKS	
CAJ	MRK	DSTI	NIPNY	INGN	CAJ	
CBT	MRO	EK	NOC	IRSN	CALP	
CCMP	MSBHY	EMKR	NOK	IVGN	CSCD	
CESI	NCX	ENER	NSM	KFT	CVV	
COP	NIPNY	ENG	NT	LLY	DNEX	
CRDN	NNPP	FCEL	PG	MDT	EGLS	
CREE	OXY	FCS	PHG	MMSI	ENTG	
CVX	PG	FJTSF	PLUG	MRK	ESIO	
CYT	PHG	FSL	QCOM	OFIX	EXFO	
DD	PX	FSLR	RFMD	PFE	FJTSF	
DOW	RDS-B	GB	RMTR	SAIC	FORM	
EMN	ROG	GD	SI	SI	HBIO	
ENTG	ROH	GE	SNE	STJ	HIT	
FEO	SI	GNSS	SPSN	UN	HPQ	
FJTSF	SLB	HON	SSNLF		ILMN	
FOE	UN	HPQ	STM		KLAC	
FUL	XOM	IBM	TOSBF		MIL	
GE	XRX	IFX	TSM		MKSI	
HAL		IMN	TXN		MKTY	
HON		INTC	XRX		MTSC	
HW		IOM			NANO	