

SINT NasdaqListed

Silicon Nitride The Material Difference®

Transforming Medicine with the Ideal Biomaterial™



FORWARD-LOOKING STATEMENT DISCLAIMER

The Material Difference

This presentation contains forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995. These statements include, but are not limited to, statements regarding our strategy; market opportunities; commercialization plans and timelines; expected benefits of our products, product candidates, and technologies; anticipated regulatory pathways, filings, and clearances; potential benefits of collaborations and partnerships; expected manufacturing or operational milestones; financial outlook; and other statements that are not historical facts. Forward-looking statements are based on our current expectations, estimates, assumptions, and projections and are not guarantees of future performance.

Forward-looking statements are subject to numerous risks and uncertainties – many of which are beyond our control—that could cause actual results to differ materially from those expressed or implied. These risks and uncertainties include, among others, those described under the heading “Risk Factors” in our most recent Annual Report on Form 10-K, subsequent Quarterly Reports on Form 10-Q, and other filings with the Securities and Exchange Commission (“SEC”). These filings are available on our website at www.sintx.com and on the SEC’s website at www.sec.gov.

Readers are cautioned not to place undue reliance on forward-looking statements. Except as required by law, SINTX undertakes no obligation to update or revise any forward-looking statements to reflect events, circumstances, or developments occurring after the date of this presentation.

Market data and third-party research presented herein are based on external sources believed to be reliable, but we have not independently verified such information. References to market size figures represent estimates of total addressable markets and do not represent SINTX’s projected revenues.

Supporting documentation for all claims: <https://sintx.com/resources/references/>

THE PROBLEM WITH CURRENT BIOMATERIALS

The Material Difference

- Metal implants containing Ni & Co can be allergenic
- PEEK devices are inert with no osteogenic properties
- Neither Polymers nor Metal are antimicrobial

Silicon Nitride devices are Osteogenic and Antimicrobial

*Subject to regulatory review. Conceptual depiction; not all devices shown are cleared or marketed by SINTX



SiNERGY® Si₃N₄ – THE IDEAL BIOMATERIAL

The Material Difference

SiNERGY® is a bioactive ceramic with unique surface chemistry ideal for use in medical device applications.

FEATURES:

- Kills 99.9% of Gram-positive and Gram-negative bacteria³
- Stimulates accelerated proliferation of Osteoblast cells¹
- Over 15 years of proven biocompatibility
- Provides clear radiographic visibility
- Potential to decrease likelihood of revision surgery due to infection



3. Bock, R.M.; Jones, E.N.; Ray, D.A.; Bal, B.S.; Pezzotti, G.; McEntire, B.J. "Bacteriostatic Behavior of Surface-Modulated Silicon Nitride in Comparison to Polyetheretherketone and Titanium." *Journal of Biomedical Materials Research Part A*, 105(5), 1521–1534 (2017). DOI: 10.1002/jbm.a.35987. ISO 22196 used to quantitatively measure antibacterial activity

1. Pezzotti G. *Silicon Nitride: A Bioceramic with a Gift*, ACS Applied Materials & Interfaces, 2019.

MATERIAL COMPARISON

Biological and Infection Behavior

Property	Silicon Nitride	Titanium	PEEK
Osteogenic Response	✓ ¹	✓	×
Osseointegration	✓ ²	✓	×
Bacterial Adhesion	✓ Reduced ^{3,4}	×	×
Biofilm Formation	✓ Reduced ³	×	×
Hydrophilicity	✓ ⁵	~	×
Need for Coatings	×	✓	✓

Findings published in peer-reviewed publications demonstrate that:

“Silicon nitride is both anti-infective and pro-osteogenic when compared to PEEK and Titanium.”

1. Lee SS, Huang BJ, et al. Enhanced osteogenic activity and cellular response on silicon nitride surfaces. *Materials Science and Engineering: C*. 2021;118:111440.

2. Bal BS, Rahaman MN. Orthopedic applications of silicon nitride ceramics. *Acta Biomaterialia*. 2017.

3. Gorth DJ, Puckett S, Ercan B, Webster TJ, Rahaman MN, Bal BS. Decreased bacterial adhesion and biofilm formation on silicon nitride compared with PEEK and titanium. *International Journal of Nanomedicine*. 2012;7:4829–4840.

4. Webster TJ, Patel AA, Rahaman MN, Bal BS. Anti-infective and osteointegrative properties of silicon nitride, poly(ether ether ketone), and titanium implants. *Acta Biomaterialia*. 2012;8(12):4447–4454.

5. Bock RM, Jones EN, Ray DA, Bal BS, Pezzotti G, McEntire BJ. Bacteriostatic behavior of surface-modulated silicon nitride in comparison to poly(ether ether ketone) and titanium. *Acta Biomaterialia*. 2015;26:372–383.

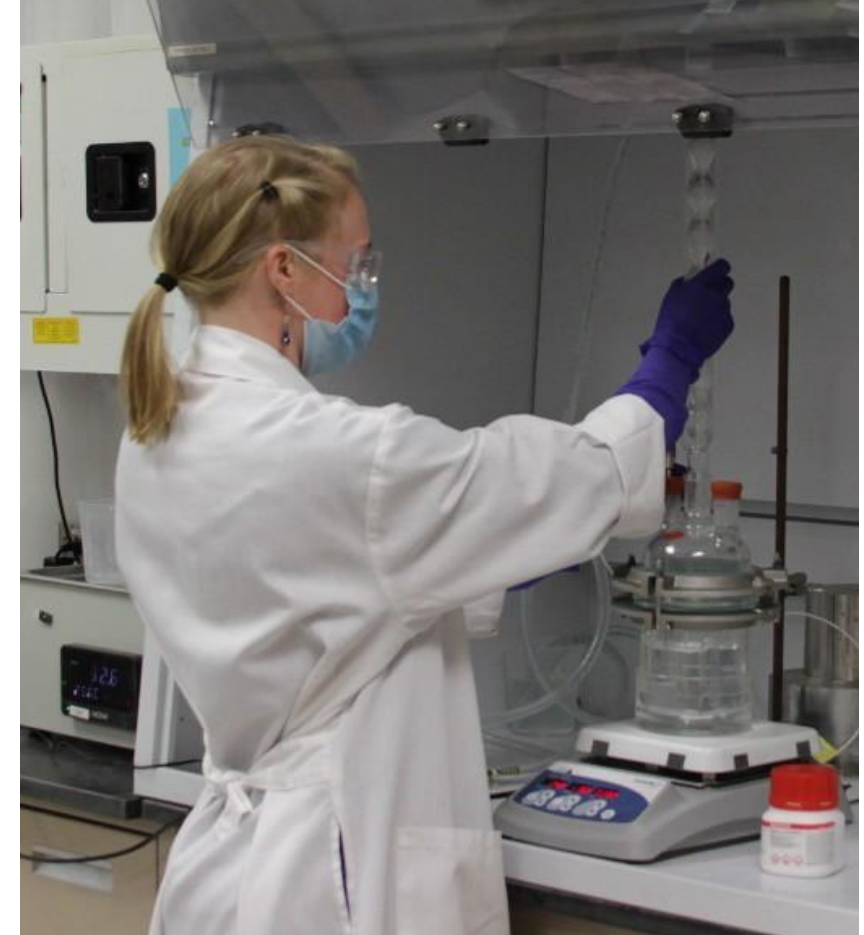
CORE STRENGTHS

Strong IP and Regulatory Portfolio

- 21 U.S. issued patents
- Maintain 4+ comprehensive FDA Master Files
- FDA 510k 12+ (Spine and Foot & Ankle)

Research and Scientific Achievements

- Research independently corroborated
- 15 SBIR/STTR grants awarded, \$4,338,665 received
- 180+ peer-reviewed and authored papers



The SBIR (Small Business Innovation Research) and STTR (Small Business Technology Transfer) programs are federal initiatives designed to support small businesses in developing innovative technologies and conducting research.

FACILITY AND PHYSICAL ASSET SUMMARY

Physical Plant in Salt Lake City, Utah

- 21,450 sq. ft of manufacturing floor space; 11,500 sq. ft. of office space
- Capable of both subtractive and additive (3D) Manufacturing
- Vertically integrated for silicon nitride manufacturing
- Inspection equipment for visual and dimensional analysis
- FDA and ANVISA registered and audited facility
- Quality certified to ISO 13485:2016 and ISO 9001:2015
- Medical-grade silicon nitride manufacturing capability remains limited within the industry



SILICON NITRIDE – FORMULATIONS

The Material Difference



Silicon Nitride MONOLITHIC CERAMICS

- Subtractive Manufactured
- Additively Manufactured (3D Printed)



Silicon Nitride COMPOSITES

- SiN / PEEK
- SiN / PEKK
- SiN / Carbon Fiber



Silicon Nitride COATINGS

- SiN Coating
- SiN / PAEK Coating



Silicon Nitride POWDER

- Fabrics
- Fibers
- Plastics
- Agribusiness

PEEK vs. PEKK:

PEEK is the long-standing, clinically proven polymer used widely in spine and orthopedic implants because it closely matches bone's mechanical behavior, is radiolucent, and offers a well-established regulatory pathway – but it is fundamentally bioinert.

PEKK, a higher-performance member of the same PAEK family, is generally stiffer, more wear-resistant, and more receptive to surface modification, allowing for improved strength and design flexibility in complex or patient-specific constructs.

In short, PEEK is the proven workhorse, while PEKK provides an incremental performance upgrade, though both remain mechanically focused materials that require additional engineering to influence biology.

Silicon Nitride + PEEK (SiN/PEEK):

Silicon nitride-infused PEEK transforms a traditional polymer implant into a bioactive composite with inherent bone-bonding and antibacterial advantages, offering a clear, defensible leap beyond both PEEK and PEKK – and a compelling innovation story for investors.

ORTHOPEDIC, SPINE AND OTHER MARKET SIZES

Global Orthopedic Sales Totaled \$61.9 Billion in 2024



PROPRIETARY AND CONFIDENTIAL

¹ ORTHOWORLD Inc 2024 Industry Annual Report

Cost of Implant Associated Infections

The Unmet Clinical Need

\$3 to \$5 billion: Total cost of MSK implant associated-infections to the US healthcare system.

Breakdown by Fixation Type:

- Fracture Fixation Hardware: \$1 – 1.5 billion annually
- Large Joint Periprosthetic Infections: \$1.8 – 2.2 billion
- Spinal Fusion: \$400 – 700 million

NEAR-TERM (0-18 MONTHS) COMMERCIAL STRATEGY

Internal Sales Coverage Model



- **SiNAPTIC® Foot & Ankle Wedges (SiNERGY)**
FDA 510(k) Devices
- **Lower Extremity Personalized Implants (SiNERGY Biocomposite)**
FDA 520(b) Customs > 510(k) Patient Specific
- **Lower Extremity Personalized Cutting Guides**
FDA 520(b) Customs > 510(k) Patient Specific
- **Lower Extremity FT/PT Screws (SiNERGY Coated Ti)**
FDA 510(k) Devices
- **CMF Implants (SiNERGY Biocomposite)**
FDA 520(b) Customs > 510(k) Patient Specific

510(k) Clearance. A premarket submission made to the FDA that allows active marketing of off the shelf, patient matched, or patient specific devices (within predetermined bounds);

520(b) Custom Exemption. Custom devices outside the scope of an existing 510(k) clearance are exempt from Premarket Approval (PMA) requirements; and are not general-use cleared devices.

SINAPTIC® FOOT & ANKLE OSTEOTOMY WEDGE SYSTEM

Entering Full Launch: Cotton, Evans and Subtalar



Silicon Nitride Solutions for Foot & Ankle Correction

SINAPTIC® Osteotomy Wedge System

Silicon nitride engineered to support reliable correction and confident fixation in foot and ankle osteotomy procedures.



Featuring: Cotton, Evans, and Subtalar Wedges

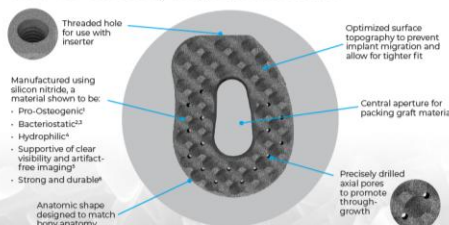


Why Silicon Nitride?

- Pro-Osteogenic**
Unique surface chemistry mechanisms have demonstrated superior protein adsorption and osteointegration when compared to traditional biomaterials.¹
- Bacteriostatic**
Surface properties have been shown to actively repel and/or inhibit the growth of various types of bacteria in a laboratory and animal studies.^{2,3}
- Hydrophilic**
Attracts fluids, further deterring bacteria colonization and enhancing bone-building mechanisms.⁴
- Enhanced Visibility on Imaging**
Unlike metal implants, SIN allows for clear visualization of the surrounding tissues in X-rays and CT scans.⁵
- Strength and Durability**
Material processing and characterization studies have demonstrated that silicon nitride exhibits high flexural strength, fracture toughness, and wear resistance suitable for load-bearing orthopedic applications.⁶

1. Lee SS, Huber S, Ferguson SJ. Comprehensive in vitro comparison of cellular and osteogenic response to alternative biomaterials for spinal implants. *Materials*. 2021;14(12):3281. doi:10.3390/ma14123281.
2. Smith DJ, Puchner S, Evans R, Webster TJ, Rahman M, Bai BS. Decreased Bacteria Activity on Si3N4 Surfaces Compared with PEEK or Titanium. *Int J Nanomedicine*. 2017;12:4629-4640. doi:10.2147/IJN.S13390.
3. Webster TJ, Patel AA, Rahman M, Bai BS. Anti-infective and osteointegration properties of silicon nitride, poly(ether ether ketone), and titanium. *Acta Biomater*. 2016;26:316-326. doi:10.1016/j.actbio.2015.08.014.
4. Beck RM, McIntire EJ, Bai BS, Rahman M, Boffelli M, Pezzotti G. Surface modulation of silicon nitride ceramics for orthopedic applications. *Acta Biomater*. 2016;26:316-326. doi:10.1016/j.actbio.2015.08.014.
5. Taylor RM, Berman J, Patel A, Brodie D, Khandekar A. SILICON NITRIDE: A NEW MATERIAL FOR SPINAL IMPLANTS. *Orthop Proc*. 2010;92-B(10):1133-1135. doi:10.1010/0101-0201.0001000100010001.
6. McIntire, BJ et al. (2018) Processing and Characterization of Silicon Nitride Bioceramics. *Biomater Dev Appl* 6: 093

SINAPTIC® Osteotomy Wedge System Features



SINAPTIC® Osteotomy Wedge System Components

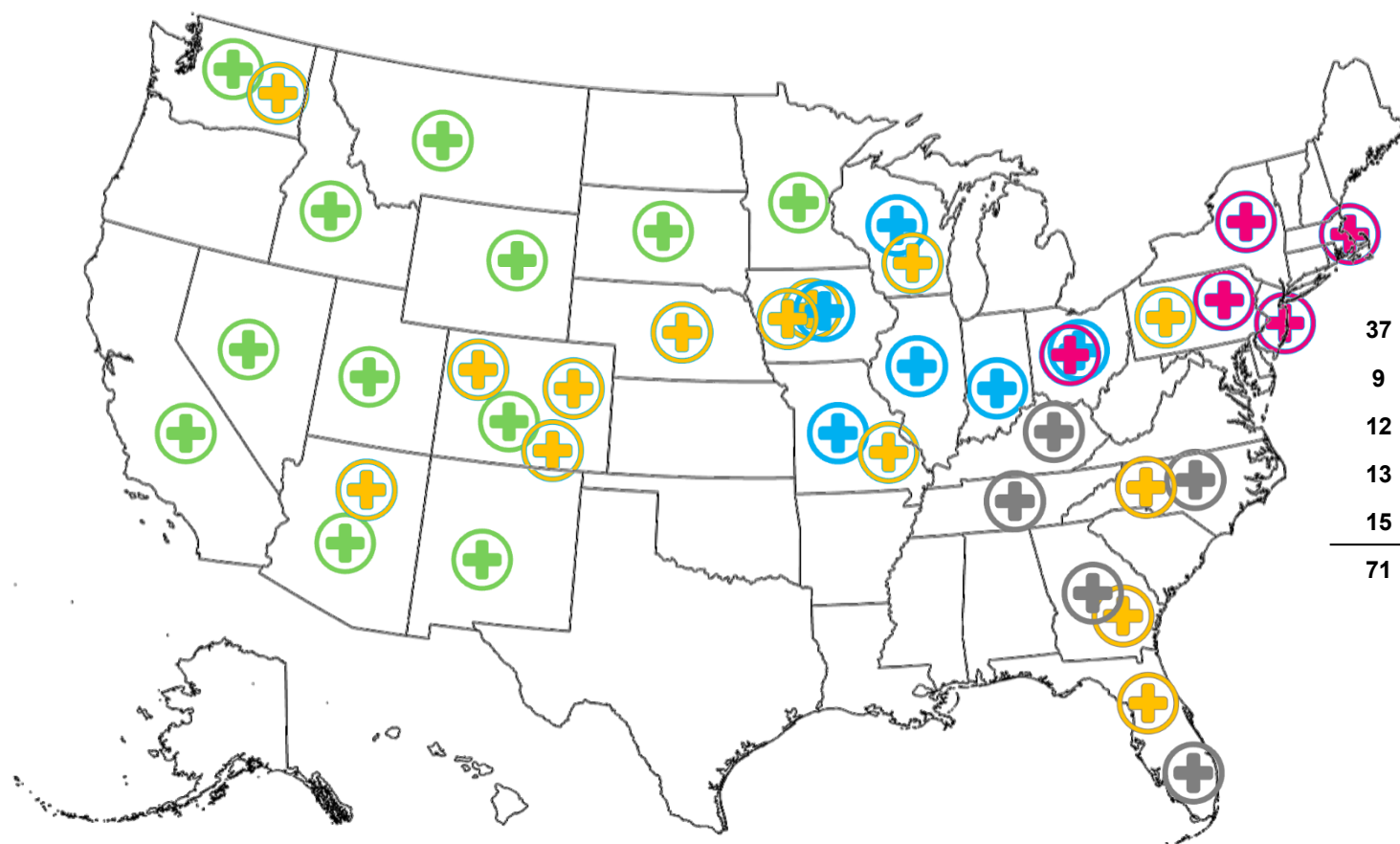
Figure 10-10

Cotton Wedge – Implants

Part #	Description	width	depth	height
10-12605		12mm	18mm	5mm
10-12606		12mm	18mm	6mm
10-12607		12mm	18mm	7mm
10-12608		12mm	18mm	8mm
10-12609		12mm	18mm	9mm
10-12610		12mm	18mm	10mm
10-12611		12mm	18mm	11mm
10-12612		12mm	18mm	12mm
10-12613		12mm	18mm	13mm
10-12614		12mm	18mm	14mm
10-12615		12mm	18mm	15mm
10-12616		12mm	18mm	16mm
10-12617		12mm	18mm	17mm
10-12618		12mm	18mm	18mm
10-12619		12mm	18mm	19mm
10-12620		12mm	18mm	20mm
10-12621		12mm	18mm	21mm
10-12622		12mm	18mm	22mm
10-12623		12mm	18mm	23mm
10-12624		12mm	18mm	24mm
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10-12628		12mm	18mm	28mm
10-12629		12mm	18mm	29mm
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10-12631		12mm	18mm	31mm
10-12632		12mm	18mm	32mm
10-12633		12mm	18mm	33mm
10-12634		12mm	18mm	34mm
10-12635		12mm	18mm	35mm
10-12636		12mm	18mm	36mm
10-12637		12mm	18mm	37mm
10-12638		12mm	18mm	38mm
10-12639		12mm	18mm	39mm
10-12640		12mm	18mm	40mm
10-12641		12mm	18mm	41mm
10-12642		12mm	18mm	42mm
10-12643		12mm	18mm	43mm
10-12644		12mm	18mm	44mm
10-12645		12mm	18mm	45mm
10-12646		12mm	18mm	46mm
10-12647		12mm	18mm	47mm
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10-12649		12mm	18mm	49mm
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10-12656		12mm	18mm	56mm
10-12657		12mm	18mm	57mm
10-12658		12mm	18mm	58mm
10-12659		12mm	18mm	59mm
10-12660		12mm	18mm	60mm
10-12661		12mm	18mm	61mm
10-12662		12mm	18mm	62mm
10-12663		12mm	18mm	63mm
10-12664		12mm	18mm	64mm
10-12665		12mm	18mm	65mm
10-12666		12mm	18mm	66mm
10-12667		12mm	18mm	67mm
10-12668		12mm	18mm	68mm
10-12669		12mm	18mm	69mm
10-12670		12mm	18mm	70mm
10-12671		12mm	18mm	71mm
10-12672		12mm	18mm	72mm
10-12673		12mm	18mm	73mm
10-12674		12mm	18mm	74mm
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10-12683		12mm	18mm	83mm
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10-12707		12mm	18mm	107mm
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SURGEON USER COMMERCIAL STRATEGY

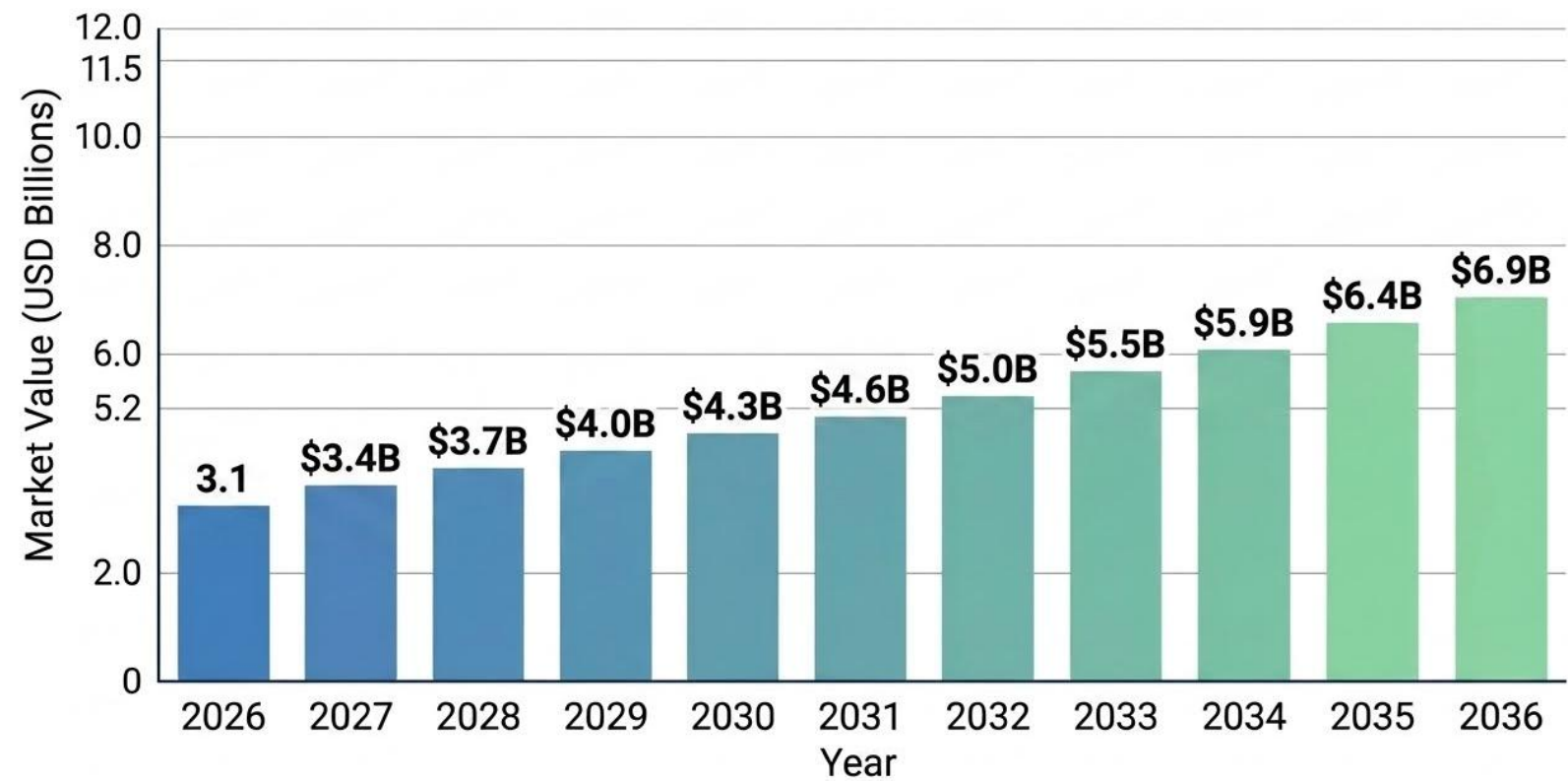
SiNAPTIC® FOOT & ANKLE OSTEOTOMY WEDGE SYSTEM | SURGEON USER GEOGRAPHY & HEAT MAP



37	West	Technology-forward markets + Mountain / Upper Plains expansion
9	Central	Core volume + distributor-led execution
12	Northeast	Academic density + KOL influence
13	Southeast	High-growth population + ASC-driven volume
15	Design Surgeon	Evans-Cotton-Subtalar
71	Surgeons	

US Patient Specific 3D Printed Implants

Market Growth 2026-2036

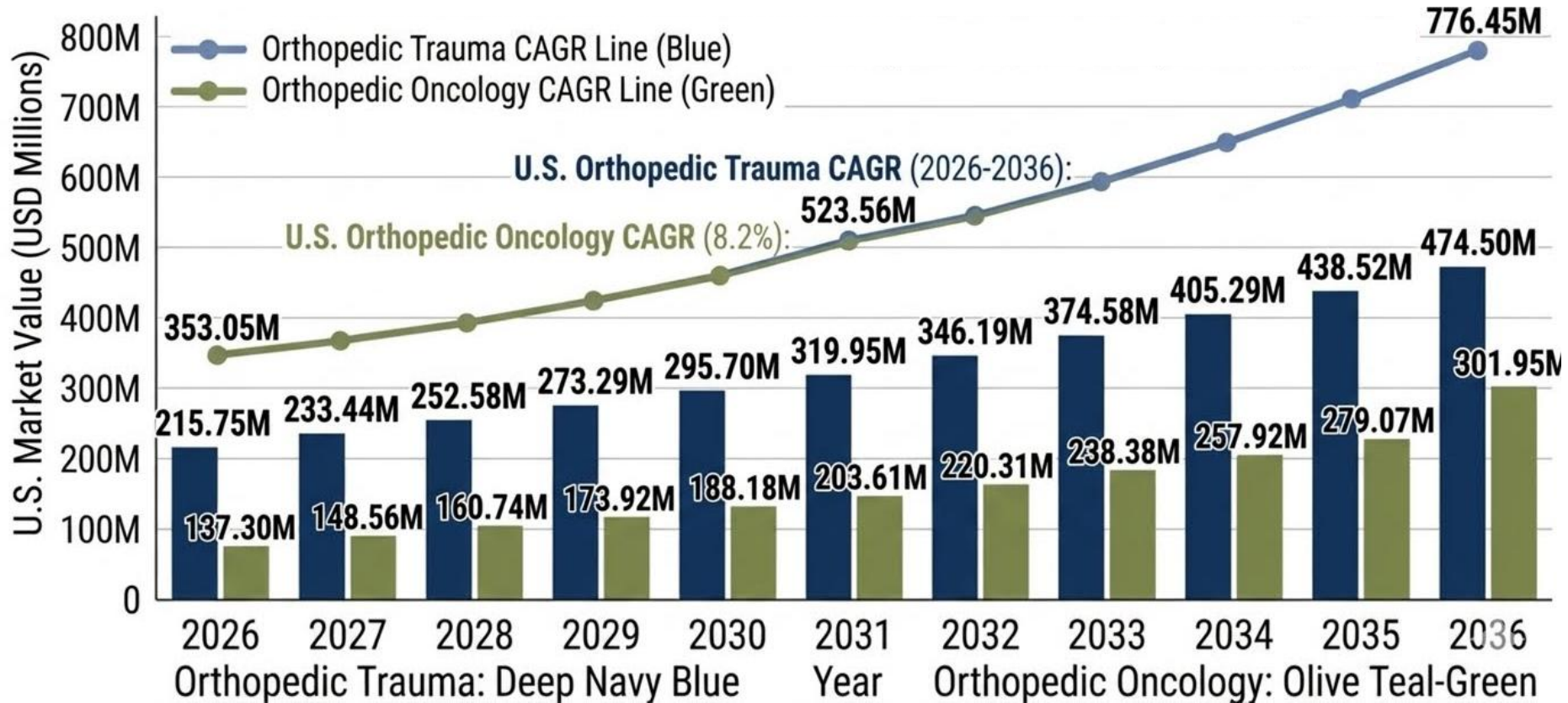


- 46% are Orthopedic applications
- 14% of those to treat Oncology
- 8.3% Global CAGR

*Future Market Insights Market Analysis; Patient Specific Surgical Implants Market *Patient Specific Surgical Implants Market to reach \$11.5B by 2036

US Patient Specific Implants

Orthopedic Trauma & Oncology Implant Market Growth 2026-2036

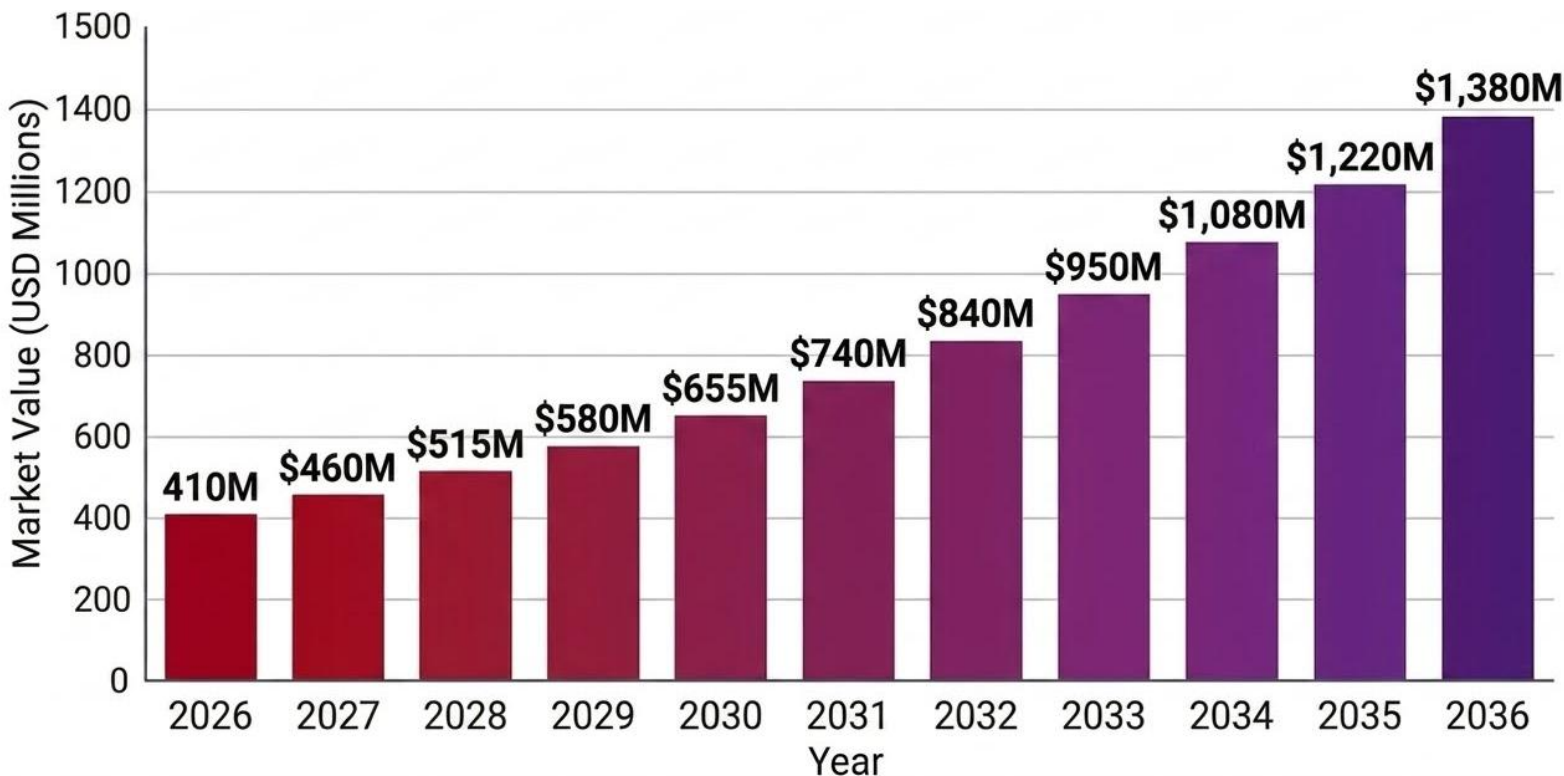


*Future Market Insights Market Analysis; Patient Specific Surgical Implants Market *Orthopedic 3D Printing Devices Market Aug '25, Report ID: 02850678

2026 US market for Trauma & Oncology PSIs is valued at \$353M with a 8.2% CAGR

US Patient Specific Implants

Cranial & CMF Implant Market Growth 2026-2036



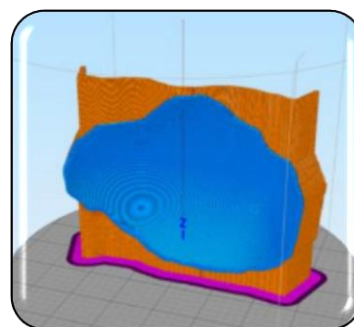
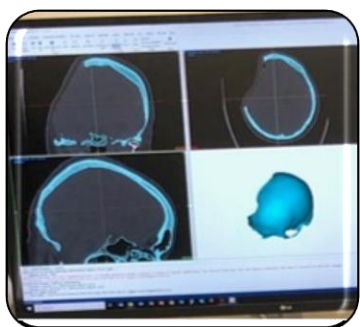
- US is ~40% of global market
- Customizable Plates ~68%
- Custom Bone Replacement ~32%

*Future Market Insights Market Analysis; Patient Specific Surgical Implants Market *Patient Specific Surgical Implants Market to reach \$11.5B by 2036

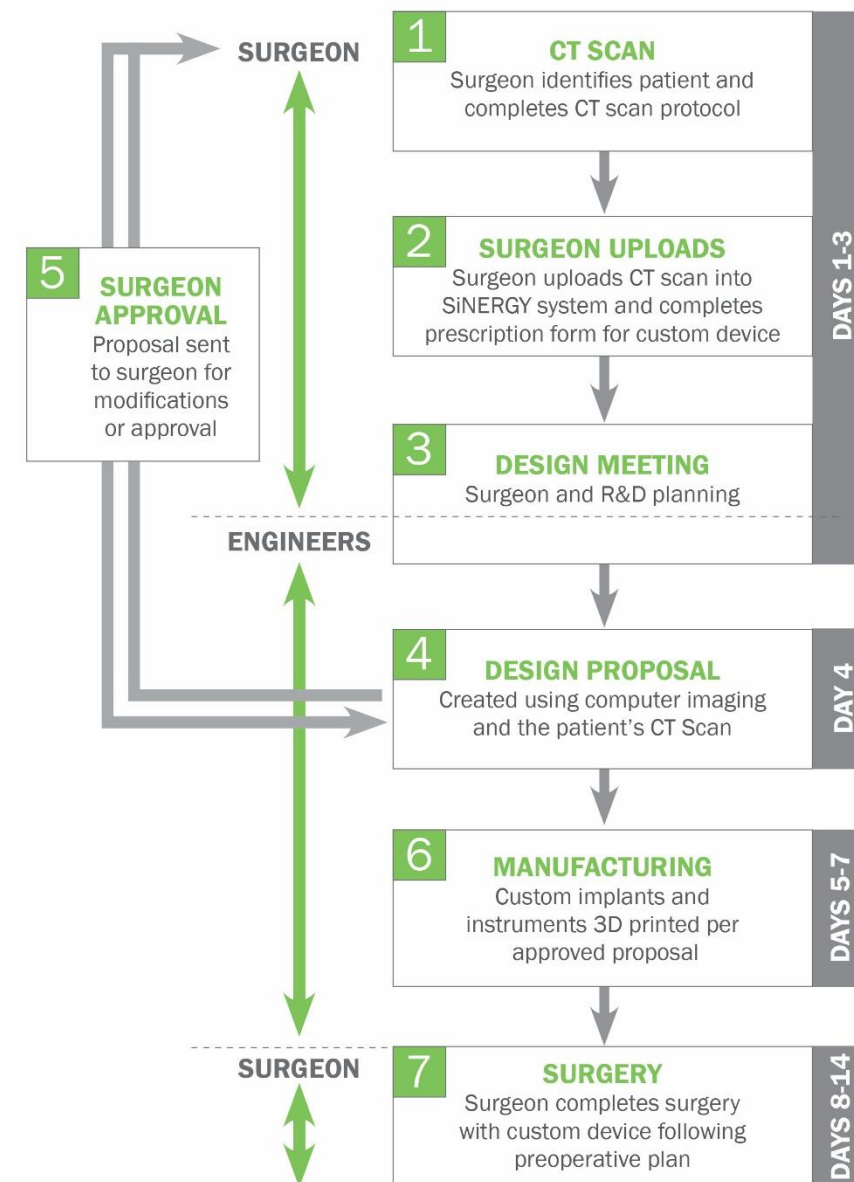
**Global Market Insights, Craniomaxillofacial Devices Market Size & Share 2025-2034, Report ID: GMI432

PATIENT-SPECIFIC DEVICE WORKFLOW

Rapid Response to Trauma with The Ideal Biomaterial



*Illustrative design workflow only. Patient-specific silicon nitride implants are not currently cleared for all clinical indications. Regulatory requirements vary by device.



SINTX Signs Agreement with **EVONIK** to Manufacture Silicon Nitride–PEEK Compound for AI-Assisted, 3D-Printed Patient-Specific Implants

Milestone Enables Production Of SiN / PEEK Custom Devices

Why the SINTX–EVONIK Agreement Matters

- **Working with a Global Giant**
EVONIK is a \$15B+ biomaterials powerhouse, now backing our SiN/PEEK platform.
- **Launching a Game-Changing Material**
First-to-market SiN/PEEK enables patient-specific implants in the Ideal Biomaterial™
- **Accelerating Growth in High-Value Markets**
Taps into AI-driven personalization, infection control & 3D-printed precision.



* Regulatory pathway for SiN / PEEK devices remain under evaluation

THE COMPETITION – MARKET MOVERS

				
Commercial-stage firm delivering AI-enabled, patient-specific spine surgery solutions. Its aprevo® platform carries FDA Breakthrough Device designation for cervical use and now qualifies for CMS NTAP reimbursement (up to \$21,125 extra, with unique ICD-10-PCS codes) starting October 1, 2025. Aims to improve outcomes, reduce costs, and set the new standard in spine fusion.	Develops PEKK-based, 3D printed implants for orthopedic and CMF/OMF applications. Its OsteoFab® platform delivers metal-free, patient-specific solutions that promote bone growth, resist infection, and streamline surgical planning to implantation.	Specializes in patient-specific musculoskeletal implants with expertise in 3D-printed osseointegrative materials (titanium, cobalt chrome), AI-based planning, and digital health tools. Offers implants for foot & ankle, hip, knee, and shoulder markets; recently divested its spine portfolio to Pressio.	Developer of customize surgical solutions designed for patients with craniofacial and other complex conditions. The company offers cranial implants, patient-matched plating, surgical planning, 3D modeling products and services, and in-house manufacturing, enabling patients to get specifically designed products to restore, replicate or optimize the original anatomy.	Provide patient-centric solutions that push the boundaries of biomaterials to transform lives and deliver unmatched clinical outcomes. SINTX unlocks the future of healing and human performance through the unique power of silicon nitride in a variety of biomedical, technical, and antipathogenic applications. SINTX is invested in both off the shelf and customized, patient-specific care in the trauma, craniofacial, and complex orthopedic verticals.
Carlsbad, CA	South Windsor, CT	Durham, NC	Dallas, TX	Salt Lake City, UT
NASDAQ GS: CARL	Privately Held	Privately Held	Privately Held	NASDAQ GS: SINT
Material = Metal & Non-Metal Titanium	Material = Non-Metal OXPEKK® (PEKK)	Material = Metal Titanium & Cobalt Chrome	Material = Metal & Non-Metal Titanium & PEEK	Material = Non-Metal Silicon Nitride
\$360M Current Market Cap		Later Stage VC Series B \$100M Completed Aug 2025	Secondary Transaction \$680M Completed in 2024	



SILICON NITRIDE MEDICAL TEXTILES

Antimicrobial Medical Textiles

Market Opportunity

- Wound Care: \$15B
- Surgical Masks: \$7B+
- Sutures: \$5B
- Drapes & Gowns: \$5B+
- Implants & Catheters: \$50B+

Lead Products

- Wound dressings
- Surgical sutures
- Surgical masks

Next Phase

- Negative Pressure Wound Therapy (PWT) foams
- Surgical drapes
- Hospital textiles (gowns, bed linens)

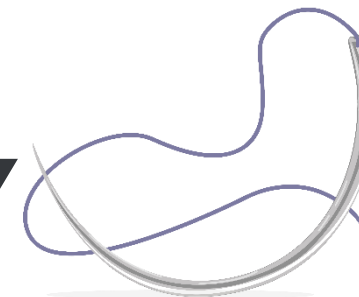
Advanced Applications

- Catheters
- Implant coatings
- Dental consumables
- Gloves



Si₃N₄ SUTURE PILOT ANIMAL STUDY

Antibacterial Wound Study



Current Status

- SOW executed and project initiated (Nov 2025)
- Study framework defined to evaluate antibacterial and tissue response
- Identification and assessment of appropriate small animal models
- Drafting of study protocol and endpoints
- Initial alignment on regulatory pathway considerations (with/without additives)

In Progress

- Final selection of animal model and study design parameters
- Coordination with contract research organization (CRO) for execution
- Development of quantitative and qualitative outcome measures
 - Bacterial load
 - Tissue integration
 - Scar formation
- Initiation of in vivo pilot study execution
- Ongoing development of regulatory strategy and predicate assessment

Desired Outcomes

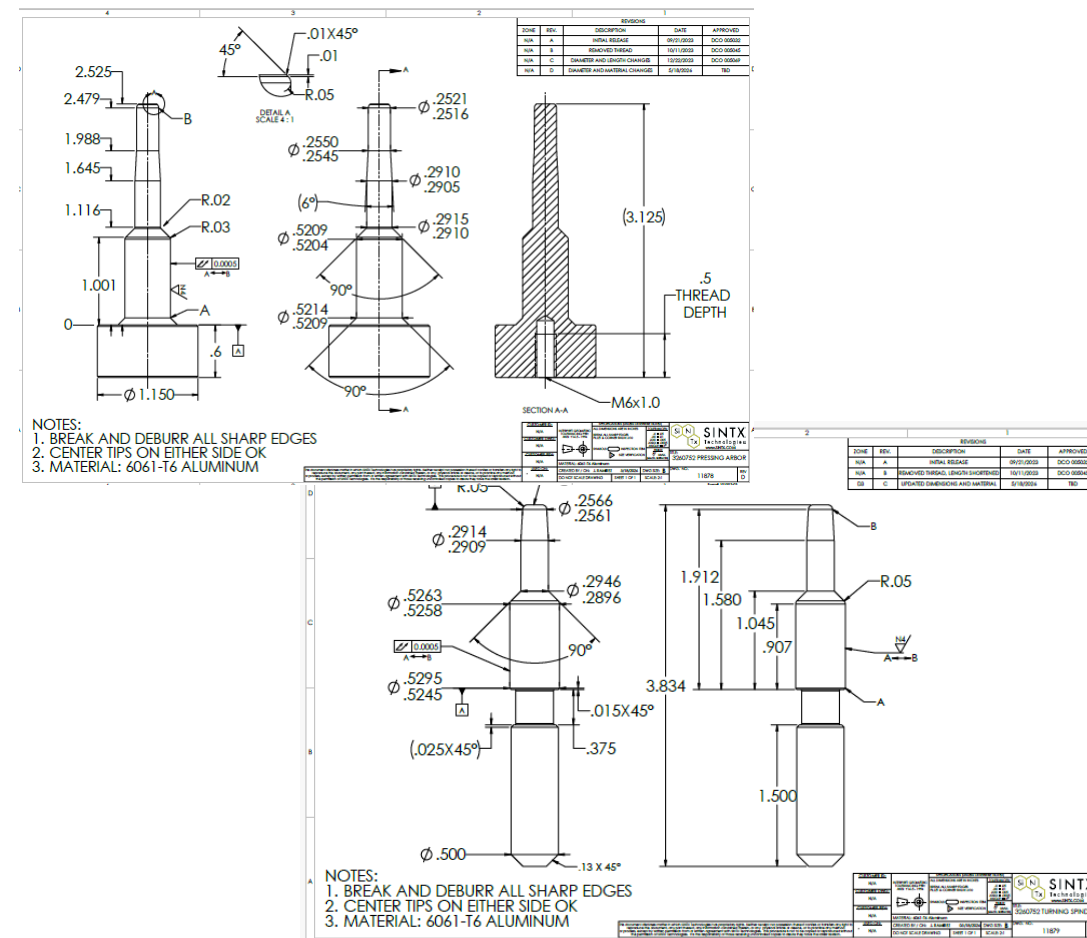
- Generate in vivo evidence of antibacterial performance vs. standard sutures
- Demonstrate improved wound healing characteristics
 - Reduced infection risk
 - Favorable tissue response
- Evaluate scar reduction and cosmetic outcomes
- Assess potential anti-inflammatory effects of silicon nitride
- Build a data package to support regulatory submission strategy
- Inform next-phase development, partnerships, and commercialization pathway

Early-stage data to support differentiation of silicon nitride sutures and guide regulatory and commercial strategy.

Aerospace Business

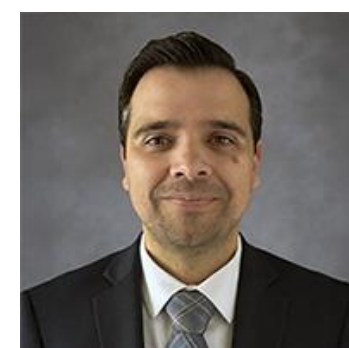
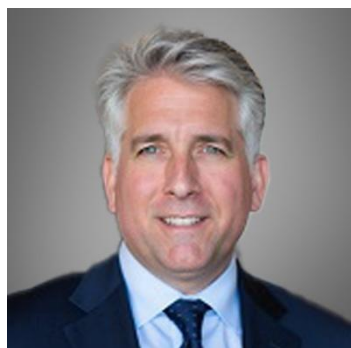
Ceramic Insulators

- SINTX manufactures complex Silicon Nitride Insulators for several multi-national Tier 1 aerospace suppliers
- Q2 contract negotiations have yielded price increases raising gross margins over 65%
- Received over \$3.2m in purchase orders among 3 customers for 2H 2026



EXECUTIVE LEADERSHIP TEAM

with Proven Success in Medical Device



ERIC K. OLSON

GREGG HONIGBLUM

RYAN ELMORE

CHRIS LYONS

KEVIN ONTIVEROS

KEVIN TRASK

CEO, Chairman

- 35 Years – Sales & Marketing
- Smith & Nephew
- Johnson & Johnson
- Zimmer – Biomet
- Facet Solutions
- Axial Biotech
- Skeletal Kinetics

Chief Investment Officer

- 35 year Investment Banker
- He co-founded Creation Capital LLC and provided over \$100 million in private equity to SINTX

President

- 15+ Years MedTech Leadership
- Invibio (Victrex)
- Drove Global Strategic Accounts
- Secured Key OEM Partnerships
- Accelerated Biomaterials Adoption

Director

- 35 Years Med Device Marketing & Business Development
- Smith & Nephew
- Medtronic

Chief Legal Officer

- Mr. Ontiveros has a B.A. in Economics from the University of Arizona, a J.D. from the University of Utah and an LLM Tax from University of Florida

Chief Financial Officer

- Mr. Trask began his career in public accounting
- Mr. Trask earned a B.S. in Accounting from California State Polytechnic University and is an actively licensed CPA

Selected Financial Data/Analyst Coverage

	Q2 '25	Q2 '26	Change %		Q3 '26**	Q4 '26**
Product Revenue	\$100,000	\$447,000	347%		\$0.9 – 1.1m	\$1.0 – 1.3m
Net Loss	\$(2,318,000)	\$(2,706,000)	17%			

- *As filed on Form 10-Q
- **Revenue guidance provided for the second half of 2026

Common shares outstanding as of August 14, 2026: **6,665,564**

ANALYST	RATING	PRICE TARGET
HC Wainright	BUY	\$10.00
Maxim	BUY	\$6.00
Partnercap	BUY	\$8.50

INVESTMENT CONSIDERATION

The Material Difference

- Industry-changing technology backed by patents, surgeon validation, and initial outcomes
- Full commercialization will commence in Q4 2026 for foot and ankle devices
- Transformative partnership with EVONIK (EVKIF)
- In discussions with numerous strategic partners to advance and commercialize textile products

Contacts

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Gregg Honigblum

Chief Investment Officer
ghonigblum@sintx.com

Investor Relations

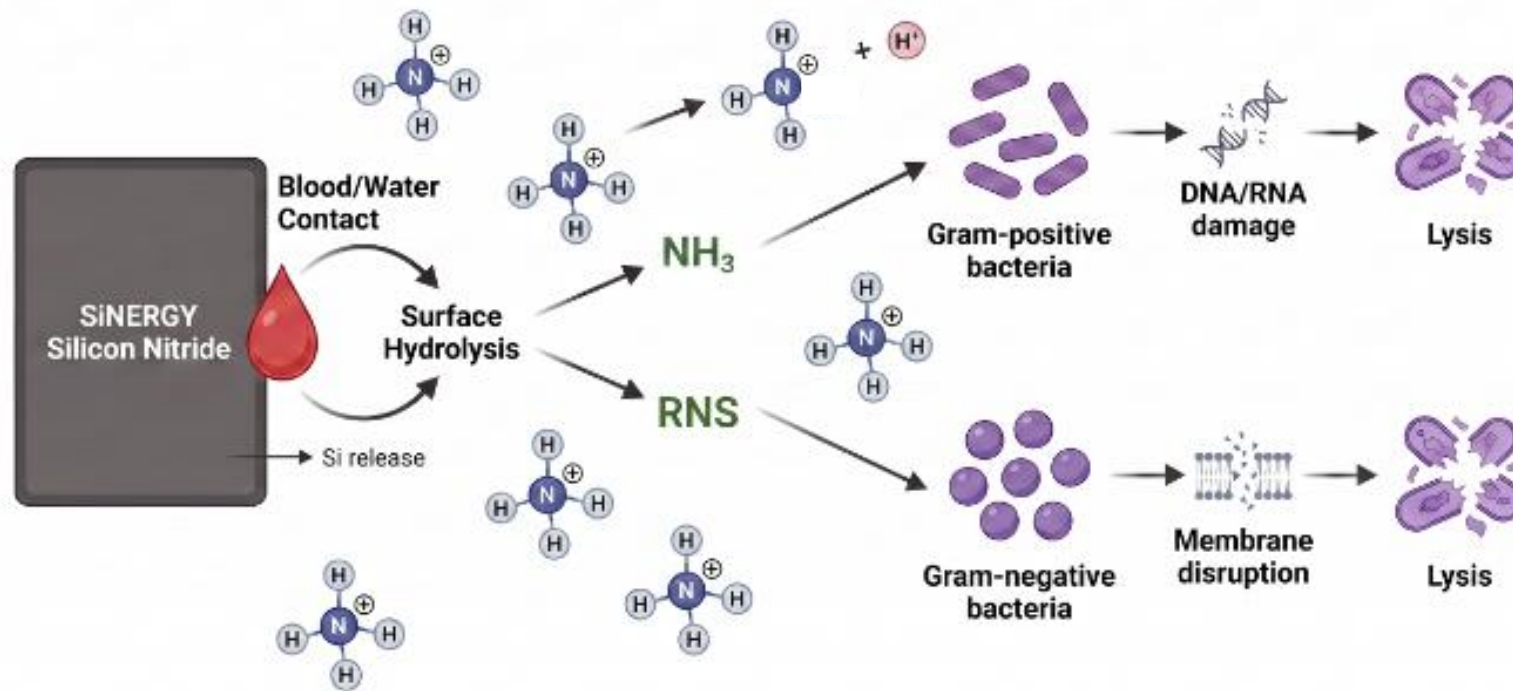
IR@sintx.com



APPENDIX

Antibacterial Mechanism of SiENERGY Si_3N_4

The Material Difference



SiENERGY Silicon Nitride devices elute Silicon and Nitrogen ions from their surface upon blood contact

Nitrogen ions bond with Hydrogen to form Ammonium, Ammonia, and Reactive Nitrogen Species.

Ammonia (NH_3) penetrates Gram-positive bacteria. RNS then form inside and damage DNA/RNA

In Gram-negative bacteria, surface RNS drive metabolic stress and osmotic membrane rupture.

Bacterial lysis results from both reactions, complimented by pH buffering at the material surface to 8.75.

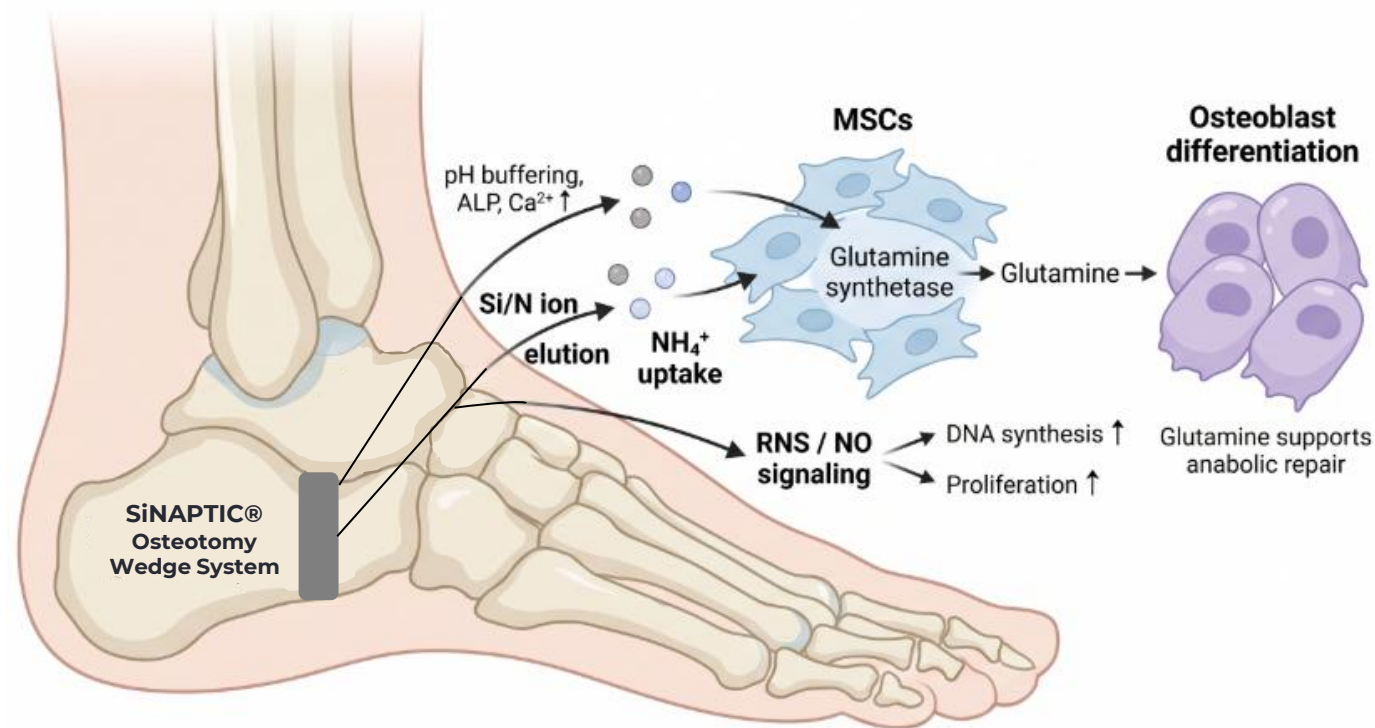
1. Pezzotti G. Silicon Nitride: A Bioceramic with a Gift, ACS Applied Materials & Interfaces, 2019.

2. Pezzotti, G.; Bock, R.M.; McEntire, B.J.; Jones, E.; Boffelli, M.; Zhu, W.; Baggio, G.; Boschetto, F.; et al. "Silicon Nitride Bioceramics Induce Chemically Driven Lysis in Porphyromonas gingivalis." Langmuir, 32(12), 3024–3035 (2016). DOI: 10.1021/acs.langmuir.6b00393.

Ammonia (NH_3) and Reactive Nitrogen Species work together to cause bacterial lysis^{1,2}

Osteoblast Proliferation due to SiENERGY Si₃N₄

The Material Difference



Mesenchymal stem cells are released at the surgical site in response to local tissue injury to support repair and healing of bone tissue.

MSCs incorporate the free Ammonium (NH₄) ions through the glutamine synthetase pathway, combining them with glutamate to form glutamine.

Glutamine is an important source of energy and provides the carbon and nitrogen elements needed to synthesize amino acids, nucleotides, glutathione, and hexosamine.

RNS (reactive nitrogen species) and free electrons form nitric oxide at low concentrations, which activates eNOS-like signaling that regulates osteoblast activity and promotes bone formation.

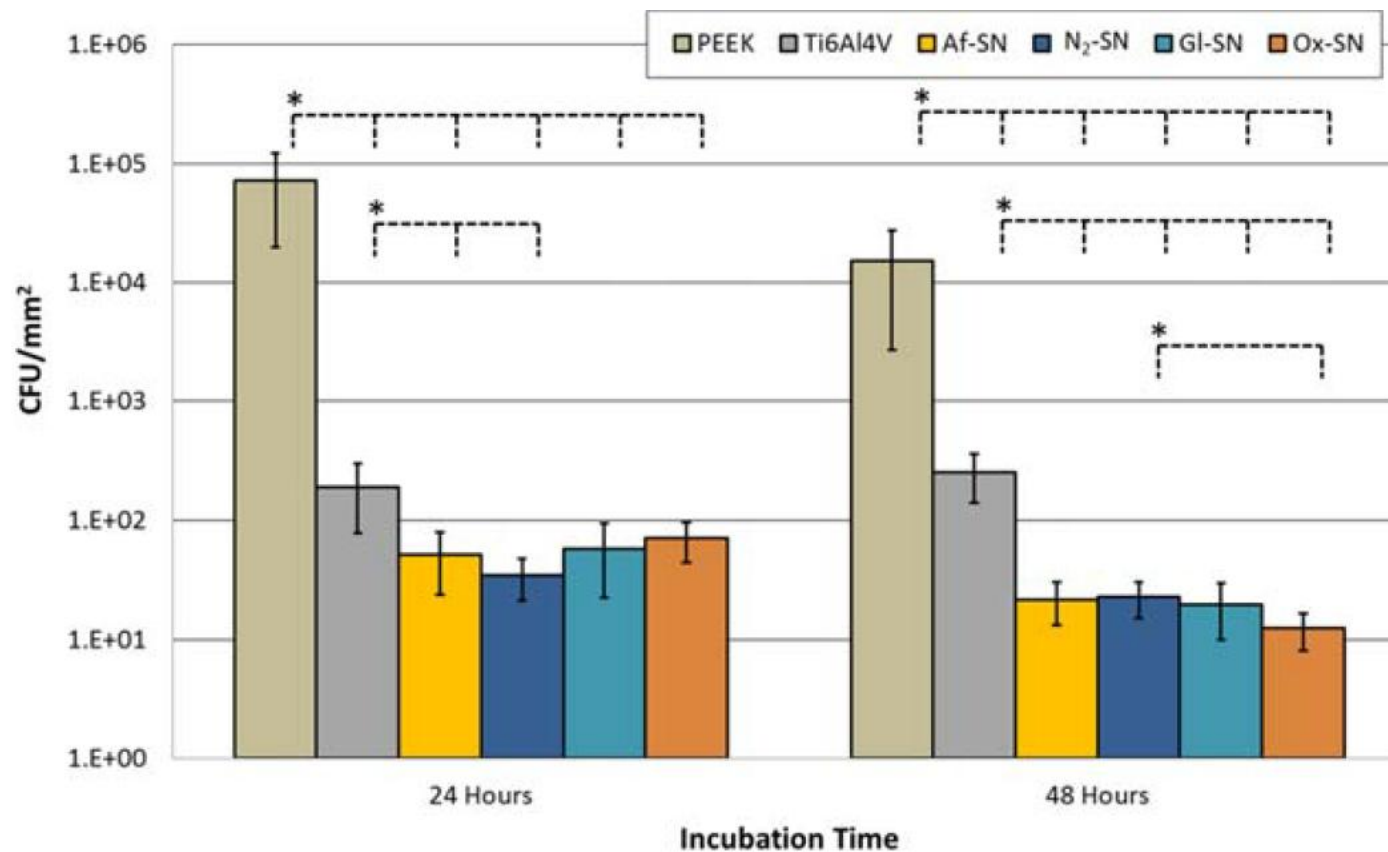
This explains why mesenchymal stem cells and osteoblasts increase upon exposure to SiENERGY Silicon Nitride.

1. Pezzotti G. Silicon Nitride: A Bioceramic with a Gift, ACS Applied Materials & Interfaces, 2019.

Mesenchymal Stem Cells use eluted Ammonium (NH₄) as fuel for Osteoblast differentiation¹

> 3.5-Log Reduction (99.9% Kill) of S. epidermidis

The Material Difference



- Experiment began with 1×10^5 CFUs of S. Epi
- SiENERGY* achieved greater than 3.5-Log reduction in 48hrs
- 3-Log Bacterial Reduction = 99.9% kill
- SiENERGY achieved >10x reduction vs Ti
- 1000x reduction vs PEEK

3. Bock, R.M.; Jones, E.N.; Ray, D.A.; Bal, B.S.; Pezzotti, G.; McEntire, B.J. "Bacteriostatic Behavior of Surface-Modulated Silicon Nitride in Comparison to Polyetheretherketone and Titanium." *Journal of Biomedical Materials Research Part A*, 105(5), 1521-1534 (2017). DOI: 10.1002/jbm.a.35987. ISO 22196 used to quantitatively measure antibacterial activity

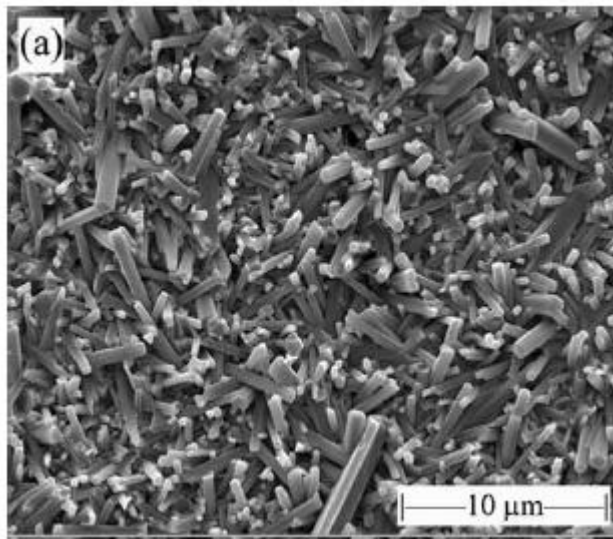
*SiENERGY corresponds to 'Af-SN' in the chart

SiENERGY Si_3N_4 was the only material to exceed Industry Standard 99.9% antimicrobial threshold³

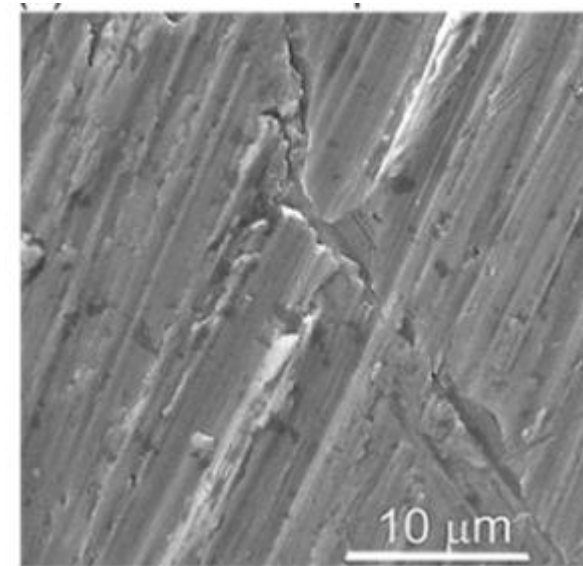
Surface Topography of SiENERGY Si_3N_4 vs Titanium

The Material Difference

**SiENERGY
Silicon Nitride**



**Machined
Ti6Al4V**



4. Pezzotti et. al. "Human osteoblasts grow transitional Si/N apatite in quickly osteointegrated Si_3N_4 cervical insert." *Acta Biomateriala*, 64 (2017) 411-420

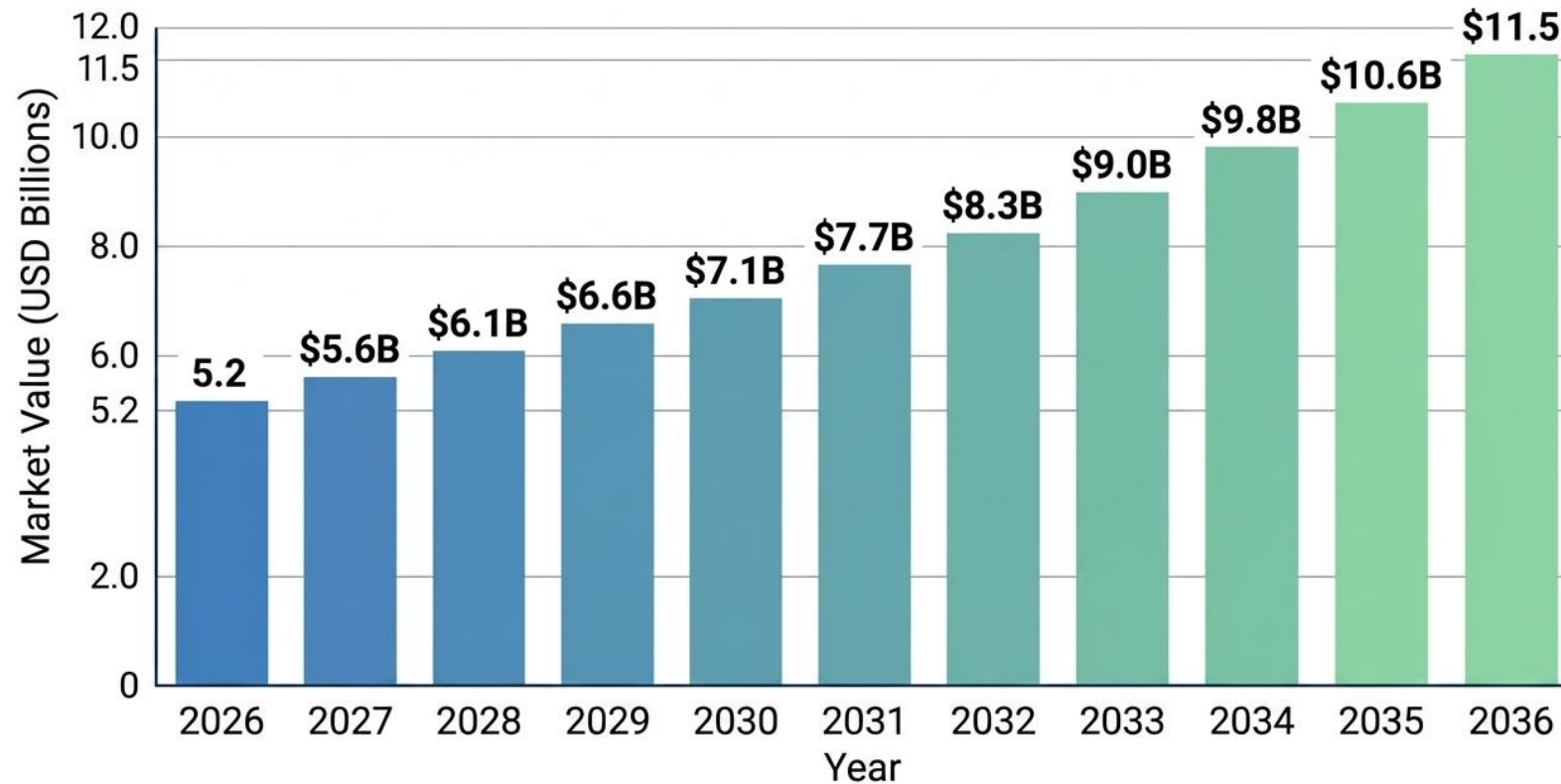
5. Webster et. al., "Anti-infective and osteointegration properties of silicon nitride, poly(ether ether ketone), and titanium implants", *Acta Biomateriala*, 8 (2012) 4447-4454

*Comparison is an as-manufactured comparison

Nano-textured SiENERGY Si_3N_4 is a highly attractive environment for osteoblast attachment³

Global Patient Specific 3D Printed Implants

Market Growth 2026-2036



*Future Market Insights Market Analysis; Patient Specific Surgical Implants Market *Patient Specific Surgical Implants Market to reach [\\$11.5B](#) by 2036

Global Patient Specific Implant market projected to grow from \$5.2 - \$11.5B by 2036*