

# BioForge — Autonomous Biomaterials Discovery Platform

The AI lab designing sustainable materials that replace plastics, concrete, and textiles.

---

## Executive Summary

BioForge is an autonomous AI platform that discovers, designs, and optimizes novel biomaterials to replace petroleum-based plastics, carbon-intensive concrete, and synthetic textiles. By combining generative AI with automated laboratory systems, BioForge accelerates materials discovery from years to weeks—enabling Fortune 500 companies to hit aggressive sustainability targets while reducing costs.

**The Pitch:** We're building the NVIDIA of sustainable materials. Every company needs to decarbonize their supply chain, but inventing new materials takes decades and costs billions. BioForge compresses that to months for a fraction of the cost.

---

## The Problem

### The \$5 Trillion Materials Crisis

#### 1. Regulatory Tsunami

- EU's PPWR mandates 65% packaging recyclability by 2025
- CSRD requires full supply chain carbon disclosure
- SEC climate rules demand material emissions reporting
- California's SB 253/261 covers Scope 3 emissions

#### 2. Consumer & Investor Pressure

- 78% of consumers prefer sustainable packaging
- \$45T in ESG assets demanding proof of impact
- Brand damage from greenwashing scandals

#### 3. Innovation Bottleneck

- Traditional materials R&D: 15-20 years, \$1B+ per material
- 99% of promising compounds never reach production
- Fragmented research across academia and industry
- No unified platform connecting simulation → synthesis → scale

#### 4. The Numbers

- 400M tons of plastic produced annually (8M tons in oceans)
- Concrete = 8% of global CO<sub>2</sub> emissions
- Textile industry = 10% of global emissions
- \$1.2T spent annually on unsustainable materials

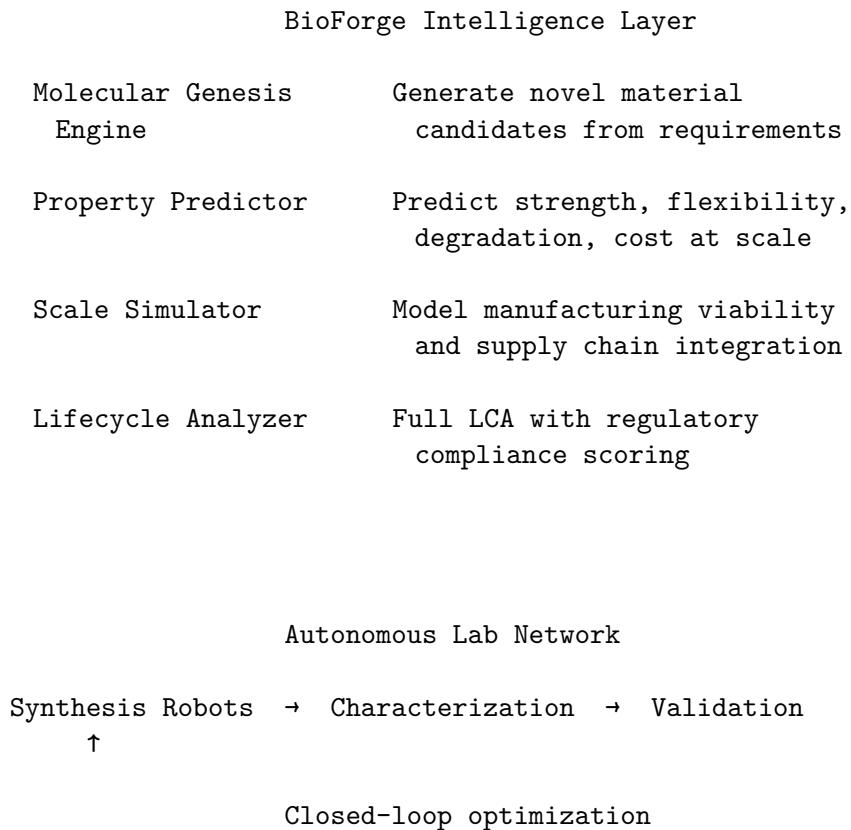
## Why Now?

- **AI maturation:** Large language models can now reason about molecular structures
- **Robotics advancement:** Cloud labs enable 100x experiment throughput
- **Policy forcing function:** 2025-2030 compliance deadlines are non-negotiable
- **Economics flip:** Oil volatility makes bio-based materials cost-competitive

---

## The Solution

### BioForge Platform Architecture



### Core Capabilities

- 1. Molecular Genesis Engine** - Input: “I need a material that’s as strong as ABS plastic, fully marine-degradable in 90 days, and costs under \$3/kg at scale” - Output: Ranked candidate molecules with synthesis pathways
- 2. Autonomous Experimentation** - Cloud lab integration (Emerald Cloud Lab, Strateos) - 10,000+ experiments/month vs 50 with traditional labs - Real-time learning from every synthesis
- 3. Scale-Up Intelligence** - Partner network of contract manufacturers - Predict manufacturing challenges before first pilot batch - Supply chain optimization for bio-feedstocks
- 4. Compliance Autopilot** - Auto-generate LCA documentation - Track against CSRD, PPWR, FDA, EPA requirements - Real-time certification pathway guidance

## Market Opportunity

### Total Addressable Market (TAM)

Segment	Size	BioForge Opportunity
Packaging Materials	\$1.2T	Bioplastic replacements
Construction Materials	\$1.5T	Low-carbon concrete, insulation
Textiles	\$1.7T	Bio-based fibers, leather alternatives
Electronics	\$500B	Biodegradable casings, substrates
Automotive	\$400B	Interior materials, lightweight composites
<b>Total TAM</b>	<b>\$5.3T</b>	

### Serviceable Addressable Market (SAM)

Enterprise R&D budgets for sustainable materials: **\$180B/year**

### Serviceable Obtainable Market (SOM)

Year 5 target: **\$2B ARR** (1.1% of SAM)

---

## Business Model

### Three Revenue Streams

- 1. Platform Subscription (70% of revenue)** - Starter: \$250K/year — 5 projects, 1,000 simulations - Professional: \$1M/year — 25 projects, 10,000 simulations, lab integration - Enterprise: \$5M/year — Unlimited, dedicated resources, IP ownership
- 2. Success Fees (20% of revenue)** - 2-5% of value captured from successful material launches - Aligned with customer outcomes
- 3. Material Licensing (10% of revenue)** - License BioForge-discovered materials to non-competing industries - Passive revenue from IP portfolio

## Unit Economics

Metric	Value
Average Contract Value (ACV)	\$1.5M
Gross Margin	82%
Net Revenue Retention	145%
CAC Payback	14 months
LTV/CAC	8.5x

## Competitive Landscape

### Traditional Competitors

Company	Approach	Weakness
BASF, Dow, DuPont	Internal R&D	Slow, siloed, legacy incentives
University Labs	Grant-funded research	No commercialization pathway
Materials Startups	Single-material focus	Can't iterate rapidly

### Tech-Adjacent Players

Company	Approach	Weakness
Citrine	Materials informatics	No synthesis capability
Kebotix	Lab automation	No materials focus
Zymergen (RIP)	Bio-manufacturing	Overbuilt wetlab infrastructure

### BioForge Advantage

1. **Full-stack integration** — From simulation to synthesis to scale
2. **Capital-light model** — Cloud labs, no massive facilities
3. **Learning flywheel** — Every experiment improves all future predictions
4. **Compliance-first** — Built for regulatory reality, not research papers

---

### Go-to-Market Strategy

#### Phase 1: Beachhead (Months 1-18)

**Target:** CPG Packaging - 10 Fortune 500 CPG companies with 2027 sustainability deadlines - Use case: Replace single-use plastic packaging - Entry point: VP of Sustainability / Chief Packaging Officer - Land with pilot (\$250K), expand to enterprise (\$5M+)

**Key Accounts:** - Unilever (pledged 100% recyclable packaging by 2025) - Nestlé (€1.5B sustainable packaging commitment) - P&G (50% virgin plastic reduction target) - PepsiCo (100% recyclable packaging goal)

#### Phase 2: Expansion (Months 18-36)

- Construction (Holcim, LafargeHolcim, CEMEX)
- Textiles (H&M, Nike, Adidas)
- Automotive (BMW, Mercedes, Ford)

#### Phase 3: Platform (Months 36+)

- Open platform to mid-market
- Materials marketplace
- Certification-as-a-service

## Technology Deep Dive

### AI/ML Stack

**Foundation Models** - Fine-tuned LLMs on 50M+ materials science papers - Custom transformers for molecular property prediction - Diffusion models for novel molecule generation

**Simulation Engine** - Density Functional Theory (DFT) calculations at scale - Molecular dynamics for mechanical properties - Coarse-grained models for biodegradation prediction

**Autonomous Science** - Multi-armed bandit for experiment selection - Bayesian optimization for synthesis parameters - Active learning to maximize information per experiment

### Data Moat

Data Source	Scale	Competitive Value
Public literature	50M papers	Baseline (everyone has this)
Patent corpus	15M patents	Synthesis pathways
Customer experiments	100K+/year	Proprietary (major moat)
Manufacturing data	Partner network	Scale-up intelligence

### Intellectual Property Strategy

- Defensive patents on AI architectures
- Aggressive filing on novel materials discovered
- Trade secrets on data processing pipelines
- Customer IP ownership in Enterprise tier

---

### Team Requirements

#### Founding Team Profile

**CEO** — Enterprise SaaS leader with sustainability passion - Ideal: Former GM at Salesforce/ServiceNow + materials science interest - Key skill: Selling \$5M+ contracts to Fortune 500

**CTO** — AI/ML leader with science background - Ideal: DeepMind/FAIR + PhD in computational chemistry - Key skill: Building reliable, scalable ML infrastructure

**Chief Science Officer** — World-class materials scientist - Ideal: MIT/Stanford professor with industry experience - Key skill: Credibility with technical buyers

**VP Engineering** — Platform builder - Ideal: Led engineering at Databricks/Snowflake scale - Key skill: Building enterprise-grade systems

#### Early Hires (First 20)

- 8 ML Engineers (molecular modeling, simulation)
- 4 Materials Scientists (polymers, composites)
- 3 Lab Automation Engineers

- 3 Enterprise Sales
  - 2 Customer Success
- 

## Financial Projections

### Revenue Forecast

Year	ARR	Customers	ACV
1	\$5M	8	\$625K
2	\$25M	25	\$1M
3	\$80M	60	\$1.3M
4	\$200M	120	\$1.7M
5	\$500M	250	\$2M

### Funding Requirements

**Seed Round:** \$8M - Build core platform v1 - Establish 3 cloud lab partnerships - Land 3 design partners

**Series A:** \$35M (Month 18) - Scale ML infrastructure - Build out enterprise sales team - 15 paying customers

**Series B:** \$100M (Month 36) - International expansion - Acquire specialized capabilities - 60 customers, \$80M ARR

### Path to Profitability

- Gross margin > 80% from Year 1
  - Contribution margin positive by Year 3
  - EBITDA positive by Year 5
- 

## Risk Factors & Mitigations

Risk	Likelihood	Impact	Mitigation
AI predictions don't translate to real materials	Medium	Critical	Tight feedback loop with labs, start with well-characterized material families
Customer R&D cycles too slow	High	High	Success-based pricing, embed in customer workflows
Regulatory changes	Low	Medium	Advisory board with regulators, flexible compliance engine

Risk	Likelihood	Impact	Mitigation
Cloud lab capacity constraints	Medium	Medium	Multi-provider strategy, eventually own critical capabilities
IP disputes with customers	Medium	High	Clear contracts, tiered IP ownership

## Why This Will Be a \$10B+ Company

1. **Massive TAM with forcing function** — \$5T market with regulatory deadlines creating urgency
2. **Platform economics** — Every customer makes the platform smarter; margins expand with scale
3. **Data moat** — Proprietary experiment data is unreplicable; compounds over time
4. **Category creation** — No one owns “autonomous materials discovery” yet
5. **Multiple expansion vectors** — Packaging → Construction → Textiles → Everything
6. **Acquisition optionality** — Strategic value to BASF, Dow, or any materials giant

## The Ask

**Raising \$8M Seed Round** - Lead: Deep tech / climate VC with enterprise SaaS experience  
 - Target investors: Lux Capital, DCVC, Khosla Ventures, Congruent Ventures - Use of funds: Platform v1, 3 cloud lab integrations, 3 design partners

**Ideal Angel Profile** - Materials science executives (Dow, BASF, DuPont) - CPG sustainability leaders - Successful enterprise SaaS founders

## Appendix

### Key Metrics to Track

**Product** - Prediction accuracy (target: 85%+ correlation with experimental results) - Experiments per month - Time from brief to viable material

**Commercial** - Pipeline coverage ratio - Win rate on pilots - Expansion revenue

**Science** - Novel materials discovered - Patents filed - Publications in partnership with customers

### Glossary

- **LCA:** Life Cycle Assessment — Environmental impact analysis

- **DFT:** Density Functional Theory — Quantum mechanical simulation
  - **CSRD:** Corporate Sustainability Reporting Directive (EU)
  - **PPWR:** Packaging and Packaging Waste Regulation (EU)
  - **Scope 3:** Indirect emissions from supply chain
- 

*Built with conviction by The Godfather*

*February 6, 2026 — Morning Drop*