Report on China's Bio-3D Printing and Optical 3D Printing Market & Competitors

Reference Links

http://amreference.com/?p=12265

https://formnext-sz.hk.messefrankfurt.com/content/dam/messefrankfurt-redaktion/formnext_south_china/%E7%99%BD%E7%9A%AE%E4%B9%A6/3d-science-valley/%E7%94%9F%E7%89%A93D%E6%89%93%E5%8D%B020250526-3D%E7%A7%91%E5%AD%A6%E8%B0%B7%E5%8F%91%E5%B8%83.pdf
Industry Development White Paper 2025

https://pdf.dfcfw.com/pdf/H3_AP202208091577052278_1.pdf
2022 Industry Overview

1. Suzhou EFL Co., Ltd. (Yongqinquan Co., Ltd.)

Information Source

Core Technology Source: Materials from Professor He Yong (https://person.zju.edu.cn/heyongzju)

Patent: https://patentscope.wipo.int/search/zh/detail.jsf?docId=CN231645562&_fid=WO2016173474

1.1 Company Basic Information

Founded in 2017 by Professor He Yong from the School of Mechanical Engineering, Zhejiang University, the company was established to commercialize the scientific research achievements of Professor He and his team. Currently, it has 60 formal employees (registered for social security), is located in Wuzhong District, Suzhou, with a registered capital of RMB 5.43 million, and is classified as a small and medium-sized enterprise.

1.2 Main Products

The company’s products are divided into equipment and consumables:

Equipment: Including DLP (Digital Light Processing) Stereolithography 3D Printers, Fused Deposition Modeling (FDM) 3D Printers, Volumetric Light (CAL) 3D Printers, and other auxiliary equipment.

DLP Stereolithography Printers: One standard model (EFL-BP86) and one multi-material derivative model (EFL-BP8601). These models are relatively mature with high precision (approximately several tens of micrometers). Videos and articles from the company's official promotion accounts confirm that these products have been initially applied in practical scenarios.

FDM Printers: Two models, also mature and already in initial market application.

Volumetric Light (CAL) 3D Printers: Only one model is available, with printing dimensions of Φ12×H25mm or Φ15×H25mm, 4K projection resolution, a wavelength of 405nm, and a single pixel size of 15μm. Its precision is inferior to that of DLP printers (approximately several hundred micrometers). Additionally, the company rarely mentions this model on its promotion accounts, with very limited promotional video materials—only a few clips of real printing processes and static displays of printed parts. The primary promotional focus is on the printer's speed. It can be concluded that this model is still in the laboratory stage, with little to no practical application.

Product prices are currently unqueryable. Since customers are mainly acquired through bidding and tendering processes, specific pricing cannot be determined.

1.3 Customer Information

According to data from enterprise inquiry platforms, the company has 55 bidding/tendering records and 16 customers. Except for one hospital (Stomatological Hospital Affiliated to Zhejiang University), one research institute, and one government innovation center, all other customers are universities, and the products are mostly used for teaching purposes.

1.4 Intellectual Property

The company holds 34 trademark registrations and 51 patent filings, including 17 authorized invention patents and 15 published invention patents.

1.5 Official Promotion Accounts

WeChat Official Account: EngineeringForLife

Bilibili Video Platform Account: ELF Bio-3D Printing

1.6 Competitive Analysis

The company's core competitiveness lies in three aspects:

Academic Backing: It is supported by Zhejiang University, a top-tier university in China. Professor He Yong continuously recruits outstanding talents (master's and doctoral candidates) from the university, ensuring a strong R&D team and competitive R&D capabilities.

Product Ecosystem: Its product line fully covers consumables, volumetric light printers, DLP printers, and FDM printers. It also provides users with technical support based on a large number of existing designs.

Industrial Chain Advantages: Suzhou has a highly developed manufacturing industry and favorable policy conditions, enabling the company to enjoy advantages in material costs and business environment.

However, in the field of volumetric light 3D printing (where direct competition with us exists), the company lacks competitiveness. Its volumetric light printer adopts CAL technology (detailed later), with poor precision (approximately several hundred micrometers), requires photosensitive materials with high viscosity, and offers no competitive advantage in printing speed. Currently, its application is limited, mostly for laboratory research purposes.

1.7 Summary

The company entered the market early, with strong R&D capabilities, high growth potential, and solid policy support—thus excelling in building a product ecosystem. Currently, it has approximately 60 employees, and its recruitment information includes sales positions. Professor He Yong continues to recruit talents from universities and has gained the trust of many academic institutions. The company is in a period of rapid growth, holding an absolute leading position in China's bio-3D printing market and actively building its own ecosystem, making it a major competitor.

In terms of volumetric light 3D printing technology, due to inherent limitations of CAL technology, its precision is far inferior to ours. However, its printer can currently print with multiple materials, giving it an advantage in the consumables ecosystem.

The company also excels in promotion:

Professor He Yong has an extensive network in the academic community, securing strong government support and unobstructed government promotion channels.

Collaborating research institutions have published numerous related papers, further expanding its reputation in the research and academic circles.

It has uploaded a large number of videos and articles on its WeChat Official Account and Bilibili account (a platform popular among college students and young people), attracting young researchers in this age group.

2. Guangzhou Lvyue Biotechnology Co., Ltd.

2.1 Basic Information

Founded in January 2023 with a registered capital of RMB 1 million, the company is classified as a micro-enterprise. Its founder, Professor Xie Maobin, specializes in the field of biological additive manufacturing and works in the Biomedical Engineering Department of Guangzhou Medical University. The total number of employees cannot be confirmed, but only two formal employees are enrolled in social insurance.

2.2 Main Products

The company has only one product model (VBP-T200) and one type of consumable in its product list:

The VBP-T200 is a volumetric light (CAL) 3D printer, featuring ultra-fast prototyping, visible light printing (instead of UV light), and high cell viability in cell-laden printing. Other technical data is limited.

The consumable is a visible light-curable material designed for use with the VBP-T200.

2.3 Customers

The company has no bid-winning records, and no customer information is available for inquiry.

2.4 Intellectual Property

It holds 13 trademark registrations and 11 patent filings, including 7 authorized invention patents.

2.5 Other Information

The company has no official promotion accounts. According to its recruitment information, it mainly hires engineering and technical personnel, with no vacancies for sales-related positions.

2.6 Competitive Analysis

Currently, the company has only one launched printer model, with unclear specific technical parameters. It is confirmed to adopt CAL technology, use visible light for printing (offering high speed), and require dedicated visible light-curable consumables.

From its staff composition, it is evident that the company is in its early stages. Bidding/tendering data shows that its products remain in the laboratory stage and have not been sold to external customers.

Due to limited available data, it is tentatively concluded that the company poses insufficient competition to us. The main reasons include: immature products (not yet out of the laboratory), early-stage operation, insufficient staff, and its supporting institution (presumably Guangzhou Medical University)—a provincial key university and "Double First-Class" university, but not a top-tier institution with outstanding

R&D capabilities. No clear news of policy support for the company has been found.

3. CAL (Computer-Axial Lithography) Technology

3.1 Technical Principles

CAL adopts an inverse algorithm similar to medical CT technology. CT converts intensity data from axial scanning into images via a computer, while CAL transforms images into light intensity signals that vary with rotation angles. For 3D models, these signals manifest as image matrix signals that change with rotation angles.

3.2 Technical Advantages

High Speed: The most significant advantage is its fast printing speed—it can print high-complexity models without the need for supports, and is dozens of times faster than DLP technology.

Theoretical Precision: In theory, its precision is extremely high, depending on the size of the projection focus.

Flexible Consumable Selection: It has relatively low requirements for consumable specificity, mainly focusing on consumable viscosity and curing threshold. Compared with Xolo technology (which requires dual wavelengths: 405nm and 505nm), CAL offers a much wider range of optional consumables.

3.3 Technical Disadvantages

Several technical challenges currently severely affect CAL's printing precision and quality:

3.1 Consumable Rotation-Related Issues: The technology requires the consumable itself to rotate. During rotation, differences in centripetal force and moment of inertia between radial liquid layers cause layer misalignment during acceleration and deceleration, leading to precision loss. To avoid misalignment:

The viscosity of consumables must be increased to reduce radial laminar flow, but this increases the difficulty of draining consumables from hollow parts through reserved holes (requiring larger reserved holes).

Precise synchronization between the rotation stage and projected images is essential, which imposes high requirements on the rotation stage's motor control, sensor precision, and system real-time performance.

3.2 Optical System Requirements: The curing area requires sufficient light energy, while other areas must receive insufficient light to avoid curing. This demands that the lens's depth of field falls within the curing position range, which in turn requires the lens to have a small aperture and long focal length. Additionally, the relationship between a consumable's light absorption depth and absorption amount is non-linear, placing high demands on light adjustment performance, light power, and light adjustment algorithms. Furthermore, an auto-focus lens is required to ensure real-time adjustment of the focus position.

3.3 Light Distortion in Transparent Materials: Transparent materials inherently cause light scattering and refraction. When light penetrates the consumable, distortion and light intensity loss are unavoidable, resulting in precision degradation. Although some studies claim to have solved this problem, significant time is still needed for engineering implementation.

Notably, as the radial printing dimension increases, the precision loss of CAL technology grows quadratically.

3.4 Competitive Technology Summary

The CAL technology patent was registered with the China National Intellectual Property Administration (CNIPA) in 2015. After being developed and open-sourced by a controversial team from the University of California, Berkeley, it has been applied in multiple fields.

Compared with our dual-wavelength curing technology, CAL is far inferior in precision but has a greater advantage in material selection (e.g., the ecosystem built by ELF). Therefore, while we hold an advantage in inherent technical characteristics, we need to focus on materials to build our own ecosystem, accelerate machine iteration, and enhance customer technical support.

4. China Market Analysis and In-China Sales Strategy

4.1 Overview

4.1.1 Bio-3D Printing: As an emerging niche market, the bio-3D printing market has grown rapidly in recent years, with a growth rate exceeding 20%. China holds the majority of patents in this field (see the Industry Development White Paper for detailed data via the link provided). Since the market is still in its nascent, technology-driven stage, its analysis cannot follow the same logic as that of a pure market economy. When formulating sales strategies, the unique characteristics of China's medical and research systems must also be considered.

4.1.2 Optical 3D Printing: Information about the optical 3D printing industry is extremely limited. Collected data mainly focuses on market analysis of 3D-printed eyeglasses. However, eyeglasses use single, mostly spherical lenses—their large size and ease of polishing mean they cannot represent the R&D status of lenses for precision optical instruments. Therefore, this analysis integrates experiences from previous interactions with optical design departments during my work in the endoscope industry, combined with additional online information.

4.2 Market Characteristics

4.2.1 Bio-3D Printing:

China's bio-3D printing market is in the downstream of the industrial chain, driven by the government's demand for developing advanced medical systems and technical maturity supported by a strong industrial chain. Despite its rapid growth, the market remains a niche within the research and academic communities. Due to the uniqueness of China's research and medical systems, it cannot be analyzed using conventional market economy thinking.

Systemic Characteristics of Research and Medical Sectors: China's overall research system relies on institutional entities (universities and CAS institutes), and the human biomedical field is highly tied to major public hospitals. A unique feature is that every public hospital in China is affiliated with a university, and its medical staff are mainly recruited from the university's faculty and graduates. This mechanism has been in place for several years—for example, in Wuhan (my hometown), the two largest and most advanced public hospitals (Tongji Hospital and Union Hospital) are both affiliated with Huazhong University of Science and Technology.

Thus, capturing the bio-medical research market of Chinese universities also means capturing the hospital market. Almost all Chinese citizens seek medical care at public hospitals, while private hospitals are extremely rare. Therefore, securing the university research market is the core to success.

Decision-Making Power in University Research: The decision-making power of university research departments largely rests with academic leaders. Most of these professors are members of the Communist Party of China (CPC) and maintain close ties with the government. Their career promotion includes not only academic advancement within the university but also improvement in political status.
Among them, young outstanding professors (aged 30–40, holding titles such as "Changjiang Scholar" or "Distinguished Young Scholar") are particularly critical. Many Chinese universities implement an "up-or-out" unwritten rule for newly appointed young professors—if they fail to achieve significant research outcomes within 2–3 years, they may lose their associate professor title or even be transferred to second-tier or third-tier universities. Winning over these professors often means securing the procurement market of the university's research department.

Preference for German Products: Chinese consumers have long held a special preference for German products. Early large-scale imports of German machinery, instruments, and equipment left a widespread impression of "precision, durability, and high quality" for German industrial products—especially in fields such as machine tools, trains, and chemical engineering. Although this preference has weakened with China's explosive industrial growth in recent years, many people still hold this initial impression (e.g., professors at my alma mater often praise Zeiss coordinate measuring machines).

Summary: China's bio-3D printing market is highly tied to universities and hospitals. The main procurement decision-making power lies with young outstanding academic leaders in university research institutes. The focus on political interests (academic breakthroughs) is stronger than on economic interests (profitability).

4.2.2 Optical 3D Printing:

The previous company I worked for was a leading domestic manufacturer of flexible endoscopes in China, with products widely sold in Europe and a subsidiary R&D company (German WISAP) acquired. Its backwardness in optical lens design has long been a key factor in its inferiority to Japanese competitors (Olympus and Fujifilm). Additionally, its manufacturing heavily relied on suppliers—for example, early products depended on Japanese Sumita Optics, and coating defects caused issues such as lens glare, reduced contrast, chromatic aberration, and coating damage. These coating problems were difficult to anticipate during lens refraction and dispersion design. According to unofficial sources, the cost of customizing a lens set prototype ranges from several hundred thousand to several million RMB, while the cost of the coating process is only tens of thousands of RMB.

Universities and research institutes differ from enterprises. For example, the Changchun Institute of Optics, Fine Mechanics and Physics (CIOMP), CAS—China's most senior institute in this field—undertakes extensive optical R&D and design work, with applications in areas such as recently developed domestic EUV lithography machine lens sets. However, research topics of these universities and institutes rarely focus on civilian lens sets. Strong government investment also makes them cost-insensitive. For instance, an associate professor at my university (a doctoral graduate from China Agricultural University) focuses on agricultural production research based on spectral analysis.

Summary: Demand for optical lens 3D printing in China's research sector is extremely limited. Most demand comes from enterprises—especially those highly dependent on the supply chain for optical manufacturing. These enterprises are typically cost-sensitive and lag behind Japanese and German peers in optical design. Since the cost of lens set prototype manufacturing is high, saving this cost to invest in lens materials (e.g., fluorite lenses) and coating design would be of great significance to them.

4.3 Sales Strategy

4.3.1 General Strategy:

The top priority for entering the Chinese market is market development, which first requires complying with local conditions and integrating into the local environment. For a foreign enterprise—especially a "high-end" European or American enterprise—it is crucial to adopt a down-to-earth approach and integrate into China’s local media and advertising ecosystems.

Examples:

In the gaming industry, the game Helldivers 2 recently launched a "Shanghai Defense" promotion campaign in China, attracting massive sales and gaining nationwide attention—even covered by China Central Television (CCTV) news.

Fabio, the German President of Shanghai Volkswagen, hosted live broadcasts in Chinese to answer netizens’ questions about the ID.3, incorporated netizen suggestions, and gained widespread attention, positive reviews, and increased ID.3 sales.

Step 1: Localization on Platforms: "Do as the locals do" by establishing a presence on popular video platforms:

Bilibili: Analogous to YouTube, it has a young user base and advanced recommendation algorithms.

Douyin: The Chinese version of TikTok, with extremely broad reach, a large audience, and advanced recommendation algorithms.
Register official accounts—especially a WeChat Official Account—to provide technical support and product information. This serves as an easily promotable "official website" with direct communication capabilities.

Step 2: Enhance Interaction: Publish videos and interact with netizens—especially on Bilibili, where graduate and doctoral students (the main force of Chinese scientific research) are frequent users, and the recommendation algorithm is advanced. Following ELF’s approach, videos should combine product demonstrations with popular science (introducing products and application scenarios, and disseminating knowledge about industry, manufacturing, and healthcare) to increase total views. Strengthen product relevance to enhance content depth.

4.3.2 Bio-3D Printing Market Strategy:

As mentioned earlier, the key to capturing the bio-3D printing market in the research and medical sectors is to target young outstanding researchers in universities. Facing "up-or-out" pressure, they must achieve academic outcomes to retain their titles (which are directly linked to academic and political prospects), so they spare no effort to produce research results.

We should start by providing equipment access in the name of joint research. After they publish academic achievements using our equipment and gain recognition in the academic community, promoting our products will become much easier. Securing the university research market will also lead to the hospital market (due to their close affiliation).

Priority Task: Identify young researchers in China working in fields such as bio-3D printing, artificial organ blood vessels, and cell culture—with a focus on young associate professors at first-tier universities and above. These professors are usually newly appointed; if they fail to achieve significant research outcomes within 2–3 years, they risk losing their titles or being transferred to lower-tier universities. We need to connect with them and support their efforts to achieve academic results.

4.3.3 Optical 3D Printing Market Strategy:

Compared with the bio-3D printing market, the optical 3D printing market is more "market-oriented." Key customers are companies with optical design needs but no in-house optical lens manufacturing capabilities—including medical endoscope companies, optical instrument manufacturers, photographic lens companies, mobile phone manufacturers, and instrument producers. These enterprises share common needs: production of relatively precise, miniaturized lens prototypes; cost sensitivity; and a desire to accelerate lens set prototype R&D to speed up product iteration.

However, the market has limitations:

High-precision cutting-edge fields (e.g., lithography machines) do not use lenses, let alone resin materials.

Low-precision, highly market-oriented industries (e.g., personal eyeglass lenses) do not require such high precision, and single-lens processing is simple.

Material limitations: For example, photographic lenses often use fluorite lenses to enhance anti-dispersion capabilities and achieve APO (apochromatic) performance.

Summary: The main entry point for this market remains the aforementioned enterprises. Promotion should be targeted at these companies—starting with medical endoscope enterprises (based on existing connections) and leveraging this network to expand to more enterprises.