

## 中国是否在推动外延设备市场？<sup>1</sup>

包括MOCVD、HTCVD和MBE在内的外延设备市场对功率和光电应用而言至关重要。Yole宣布其2026年市场规模为11亿美元。

### 内容概览：

- 市场数据：

MOCVD的市场规模<sup>2</sup>预期将以7%的CAGR<sup>3</sup><sub>2020-2026</sub>增长，至2026年可达6.3亿美元。

HTCVD<sup>4</sup>市场将以9.5%的CAGR<sub>2020-2026</sub>增长，至2026年将达到约3.93亿美元。

MBE<sup>5</sup>设备市场价值将在2026年达到6800万美元。Yole宣称其在2020年至2026年间的CAGR为7.1%。

MOCVD在大规模量产市场上占有很大比重。以设备市场2020年的营收来看，它所占的市场份额超过60%。

- 技术趋势：

对设备类型的选择取决于各种因素，如外延层的质量、生长速度、COO和可以生长的材料体系。

MOCVD和MBE设备主要用于GaAs<sup>6</sup>、GaN<sup>7</sup>、InP<sup>8</sup>等化合物半导体材料。

HTCVD技术则专门用于制造基于Si<sup>9</sup>和SiC<sup>10</sup>的器件。

- 供应链：

排名前三的设备供应商是爱思强（Aixtron），维易科（Veeco）和中微半导体（AMEC）。

在2020年的超越摩尔定律领域的外延设备市场中，这些公司所占份额为62%。

HTCVD碳化硅细分市场主要由日企东京威力科创（TEL）主导，另一方面，HTCVD硅外延设备市场则由美国领先设备企业应用材料公司（Applied Materials）主导。

在MBE方面，法国公司Riber继续占据市场领导地位。

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<sup>1</sup>摘自：《用于超越摩尔定律的外延设备报告》Yole Développement，2021

<sup>2</sup>MOCVD：金属有机化学气相沉积

<sup>3</sup>CAGR：年均复合增长率

<sup>4</sup>HTCVD：高温化学气相沉积

<sup>5</sup>MBE：分子束外延

<sup>6</sup>GaAs：砷化镓

<sup>7</sup>GaN：氮化镓

<sup>8</sup>InP：磷化铟

<sup>9</sup>Si：硅

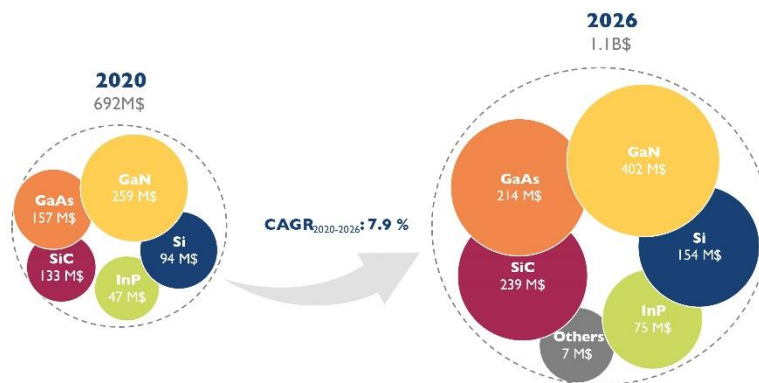
<sup>10</sup>SiC：碳化硅

“我们正处于一个关键的历史时期，身边的每一个设备都在变得更智能、更环保、更小巧”，**Yole Développement (Yole) 公司**的半导体制造团队技术与市场分析师 **Vishnu Kumaresan** 博士称。他补充道：“就连严酷的新冠疫情形势也只是进一步加速了半导体产业的技术创新，因而对该产业只产生了积极影响。在这场创新竞赛中，各厂商都在使用超越摩尔定律的方法为我们的日常设备添加更多功能，不仅通过缩小尺寸，更是通过使用非硅材料以及通过对它们进行异构集成来改善 PPAC<sup>11</sup> 特性。”

鉴于此，硅基细分市场以及包括 GaAs、GaN、SiC 和 InP 等非经典基板的其他细分市场都正在以显著的 CAGR 增长。然而，对这些材料的选择也伴随着对材料质量的严格要求，因此需要利用外延设备来生长超纯薄膜。

### 2020-2026 epitaxy equipment market evolution by epi-material

(Source: Epitaxy Equipment for More than Moore 2021 report, Yole Développement, 2021)



截至 2020 年，用于超越摩尔定律的外延设备销售额总共约为 6.92 亿美元，预期将以 8% 的 CAGR<sub>2020-2026</sub> 增长，至 2026 年可达 11 亿美元。然而，这些数字并不足以体现汽车 (EV/HEV<sup>12</sup>)、消费 (智能手机、智能手表, AR/VR<sup>13</sup>)，和航空航天与国防等细分市场中，外延工艺在任务关键型应用中的活力和无处不在。更耐人寻味的是，你会发现这些用于 HVM<sup>14</sup> 的复杂外延设备系统都是由少数几家厂商提供的，包括一些在主流前端市场不太知名的企业。

市场研究与战略咨询公司 Yole 今天发布了 《用于超越摩尔定律的外延设备报告 2021 版》。分析师们通过这项新发布的半导体制造研究报告介绍了外延设备市场的现状，并提供了各种应用的相关详情。Yole 半导体制造团队的目标是对涉及外延层的技

<sup>11</sup>PPAC: 功率-性能-面积-成本

<sup>12</sup>EV/HEV: 电动车/混合动力车

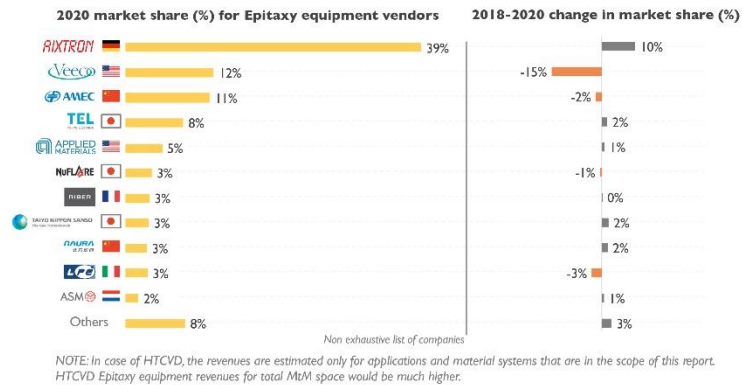
<sup>13</sup>AR/VR: 增强现实/虚拟现实

<sup>14</sup>HVM: 大规模量产

术趋势进行全面介绍。该报告还明确了外延领域的关键竞争厂商，从而带来了各设备供应商的关键信息简述、竞争格局，以及对供应链协同效应的深入探讨。

## 2020 epitaxy equipment market share

(Source: Epitaxy Equipment for More than Moore 2021 report, Yole Développement, 2021)



正如这份新发布的《用于超越摩尔定律的外延设备报告 2021 版》中分析的那样，在目前，满足这种对设备的大需求量的只有极少数设备供应商。

Yole 一共指出了大约 11 家超越摩尔定律领域的主要外延设备供应商。前三名是来自德国的爱思强（Aixtron）、来自美国的维易科（Veeco）和来自中国的中微半导体（AMEC），它们在 2020 年显然占据了市场主导地位，在营收方面所占市场份额超过了 60%。然而，这个市场更为复杂。事实上，其他各类前端设备巨头也占有一席之地。Yole 的分析师以应用材料公司（AMAT）、东京威力科创（TEL）、ASM International，Naura 这几家公司举例说明；一些特定领域的竞争企业，如大阳日酸株式会社、株式会社纽富来科技，LPE；还有一些未指名的中国初创企业。

在 Yole 的 Vishnu Kumaresan 博士看来：“2020 年的市场份额由前三大企业主导并不是什么意外，至少自 2018 年以来一直是如此。但如果我们只看排名前两位的公司，从 2018 年到 2020 年间，德国设备公司爱思强（Aixtron）的市场份额提高了 10%，而美国的维易科（Veeco）的市场份额则下降了 15%。造成这种情况的众多原因之一是中美贸易的紧张局势，而半导体行业正是这场矛盾的战场之一。由于外延设备市场的需求主要由中国带动，这场战斗在该领域更为激烈。于是 2020 年成了爱思强在中国销售表现最佳的年份之一，其营收中有大约 57% 来自中国地区，而维易科的营收中仅有 13% 来自中国。”

自然，爱思强继续在整个外延设备市场中保持领先地位，而 Veeco 也保持着亚军位置（这要归功于其 2020 年 MBE 收益的增长）。

与此同时，中微半导体（AMEC）紧随其后位列第三，出货了大量用于 LED 器件的设备

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Yole 的分析师预计，随着地缘政治局势的演变和供应链的日益脆弱，设备供应商之间的竞争将在未来几年加剧。

*Yole Développement 全年不断发布大量有关半导体制造的专题报告。*

*专家们还会进行各种重要讲演、组织关键性会议，并采访业界领先企业。他们致力于为您带来关键结果和技术与市场趋势，并阐释重大变化。*



*借此机会，我们诚邀您参加2021年欧洲国际半导体展览会SEMICON EUROPA，本次展览会将于2021年11月16日（星期二）到11月19日（星期五）在德国慕尼黑举行。马上通过 [i-Micronews](#) 注册吧！*

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### About our Semiconductor Manufacturing team

**Vishnu Kumaresan, PhD.**, is a Technology & Market analyst in the Semiconductor Manufacturing Team, part of the Semiconductor, Memory & Computing division of Yole Développement, France. He focuses on the semiconductor manufacturing domain, covering both equipment and material segments. His scope includes mainstream microelectronic applications as well as More-than-Moore applications. Having lived and worked in four countries, he has more than 11 years of international experience in the electronics industry, covering semiconductor, display, and software technologies. Prior to joining Yole, he worked as an Epitaxy engineer at Aledia, an advanced startup in the microLED display industry and has previously gained corporate experience at IMEC, CNRS, Saint-Gobain and Infosys. Vishnu obtained his PhD in Epitaxy, Material Physics & Chemistry from Sorbonne University, France, and his Masters in Microelectronics from National University of Singapore and Technical University of Munich, Germany.

**Gaël Giusti, PhD.**, is a Technology & Market Analyst specializing in Semiconductor Manufacturing at Yole Développement (Yole). As part of the Semiconductor, Memory & Computing division at Yole, Gaël's expertise is focused on materials, equipment, and manufacturing processes. He is involved daily in the production of technology & market reports and custom consulting projects. Prior to Yole, Gaël served as a R&D engineer at Sil'Tronix Silicon Technologies for 5 years where he was in charge growing epitaxial AlN thin film on sapphire for RF applications. Gaël holds a master's degree from ENSICAEN (Caen, France) as well as a PhD in Materials Science from the University of Birmingham (UK).

**Taguhi Yeghoyan PhD.**, is a Technology & Market Analyst, Semiconductor Manufacturing at Yole Développement (Yole), within the Semiconductor, Memory & Computing division. Taguhi's mission is to follow daily the semiconductor industry and its evolution. Based on her expertise in this field, especially on the semiconductor value chain (processes, materials, equipment, and related applications), Taguhi performs technology & market reports and is engaged in dedicated custom projects. Prior to Yole, she worked in world-class European research centers and laboratories, including imec (Belgium), LMI (Lyon, France) and LTM at CEA Leti (Grenoble, France). All along her past experiences, Taguhi has authored or co-authored one patent and more than nine papers. She has graduated from Wroclaw University of Technology (Poland) and University of Lyon (France). Taguhi also completed her PhD. in Material Science from the University of Lyon (France).

**Emilie Jolivet** is Director of the Semiconductor, Memory & Computing Division at Yole Développement, part of Yole Group of Companies, where her specific interests cover package & assembly, semiconductor manufacturing, memory and software & computing fields. Based on her valuable experience in the semiconductor industry, Emilie manages the expansion of the technical and market expertise of the Semiconductor and Software Team. The team interacts daily with leading companies allowing semiconductor & software analysts to collect a large amount of data and integrate their understanding of the evolution of the market with technology breakthroughs. In addition, Emilie's mission focusses on the management of business relationships with semiconductor leaders and the development of market research and strategy consulting activities inside the Yole group. Emilie Jolivet holds a Master's degree in Applied Physics specializing in Microelectronics from INSA (Toulouse, France). After an internship in failure analysis at Freescale (France), she was an R&D engineer for seven years in the photovoltaic business where she co-authored several scientific articles. Enriched by this experience, she graduated with an MBA from IAE Lyon and then joined EV Group (Austria) as a business development manager in 3D & Advanced Packaging before joining Yole Développement in 2016

### About the report

#### Epitaxy Equipment for More than Moore 2021

*The market for epitaxy equipment, such as MOCVD, HTCVD, and MBE, crucial in Power and Optoelectronic applications, is expected to reach around \$1.1 B in 2026. – Performed by Yole Développement*

#### **Companies cited:**

Aixtron, AMEC, Applied Materials, ASM International, CSD Epitaxy, DCA Instruments, Epiluvac, Epistar, II-VI, Infineon, IntelliEPI, IQE, LPE S.p.A, MBE Komponenten, Naura, Nexperia, NuFlare, Onsemi, Power Integrations,

Riber, SOITEC, STMicroelectronics, Taiyo Nippon Sanso, Tokyo Electron (TEL), TOPEC, TSMC, Veeco, VPEC, Wolfspeed, X-Fab and many more...

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