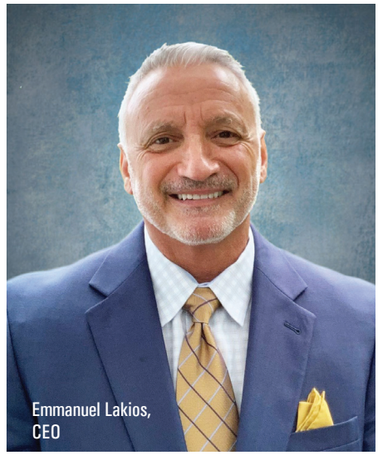
CVD Equipment Corporation

Making Electrification of Everything a Reality

In the past, electric cars were considered a discretionary and niche product. They were expensive, had limited range, and were only suitable for city driving. In recent years, however, electric cars have evolved at an unprecedented rate. State-of-the-art battery technology, charging capability, and new designs and innovations are redefining how we think about electric vehicles.

Over 30 million electric cars are projected to be produced by 2030. However, the dream of everything electric can only be realized with companies such as CVD Equipment Corporation (CVDE). Established 40 years ago, CVDE designs and manufactures turnkey chemical vapor deposition (CVD) systems to a wide range of industries, including microelectronics. Today, they are supporting the revolution of the "Electrification of Everything" by designing and manufacturing next generation CVD capital process equipment to make powering electric vehicles (EVs) more efficient and affordable to operate.


Emmanuel Lakios, CEO

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In the fast-modernizing ecosystems of the future, the silicon-based power semiconductors that became the backbone of circuitry, may soon lose their relevance. With battery charging and conversion alternatives such as gallium nitride (GaN) and silicon carbide (SiC) which allows for higher power density and increased efficiency compared to its silicon predecessor, their integration in semiconductor devices such as MOSFETs and transistors are paving the way for contemporary automotive and industrial applications.

Physical Vapor Transport (PVT) is the leading manufacturing method used to grow silicon carbide (SiC) boules which are subsequently processed into epi-ready wafers. CVD Equipment manufactures high-performance PVT systems exclusively engineered to support the production of superior quality SiC boules for high yield SiC wafers. It enables the growth of 150 mm diameter monocrystalline boules with the ability to process 200 mm for the upcoming market demand. With CVDE's dedication to solve customers' most complex challenges, their expertise in equipment design, and their high touch customer service, CVDE is positioned as a key player to meet the demand for PVT systems, with a product portfolio that includes standard configurations and customized solutions.

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The Company's four decades of industry experience enables CVDE to create technologies that surpass industry standards. For instance, it has a portfolio of exceptional process controls that can maintain pressure within +/- 1% of set point and temperature within +/- half a degree at temperatures well in excess of 2000 degrees Celsius during long deposition runs, which is instrumental for producing high-quality, low defect SiC boules.

For equipment manufacturers, the availability of raw materials and OEM components is one of today's greatest challenges. The disruption in supply chain is due to the lingering effects of the COVID-19 pandemic and geopolitical instabilities abroad. CVDE has taken decisive steps to overcome this obstacle. By vertically integrating its operations and partnering with suppliers that can steadily provide high-quality, reliable materials, and secure availability for items that require long lead times to meet the demands of its growing customer base.

> Today's technology trend is to enhance the electrical performance of the existing carbon powder with the addition of silicon (Si), in the form of a coating or nanowires to supercharge the graphite anode. With the capacity to store up to 10 times more energy than graphite alone, infusing energy-dense silicon nanowires into the anodes of EV battery grade graphite can make the silicon accessible to the lithium ions, which eliminates the issues of silicon expansion and stability. Enabling the potential to achieve longer driving range at reduced cost

CVDE has invested in its manufacturing facility in New York, where it fabricates many of the components for their chemical vapor deposition systems. The 135,000 square foot manufacturing facility enables CVDE to accelerate time to market and be more responsive to customer needs. CVDE has strong capabilities in computational modeling, which reduces the iterations of prototypes and reduces time to market. This vertical integration strategy and CVDE's commitment to operational excellence has allowed them to reduce costs without sacrificing quality, become self-reliant, and decrease its dependency on third-party suppliers.

CVDE serves a wide range of customers including government laboratories, universities and scientific institutes, defense contractors, as well as commercial entities, supporting process equipment needs from advanced R&D through high volume production systems. In 2022 CVDE launched its PVT system with an emphasis on performance, quality, and time to market.

A further area where CVDE serves the EV industry is with the enhancement of battery anode materials. In 2022 the company launched its powder coat process system. The PowderCoat 1104™, a chemical vapor deposition and infiltration system was developed to deposit both continuous coatings (e.g. Si, C, oxides, metal) as well as nanowires on particles' surfaces with superior uniformity and cost effectiveness. Their powder coating systems are designed for high-volume manufacturing. Particle size can vary from sub-micron to hundreds of microns, and the coating thickness and nanowires can be a few nanometers to tens of microns.

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Two different powder coat process technologies are offered by their company, one is a Fluidized Bed CVD process with a vertical reaction chamber and the other is a horizontal rotating barrel configuration. The tumbling process can coat particles from a few grams to a hundred kilograms to support high-volume EV battery electrode manufacturing.

CVDE also prides itself in building comprehensive and innovative solutions at its New York facility. They supply the hazardous gas storage, and delivery, process reactor, and exhaust treatment subsystems as a complete integrated solution.

CVDE owes its success to its customers, employees, and stakeholders. Their success is derived from creating a vision, articulating the vision, passionately owning the vision, and relentlessly driving the vision to completion. With the company's vast experience in equipment process development, CVDE has evolved into an industry leading capital equipment manufacturer, building a world of difference in the standard and custom chemical vapor deposition system offerings.

Looking into the future, two things are certain. One, that the dream of the "Electrification of Everything" is inevitable. Two, CVD Equipment Corporation will play an integral role in realizing this dream.