

Electronic Chemicals: PCB Chemicals and Semiconductor Packaging Materials

30 December 2019

Abstract

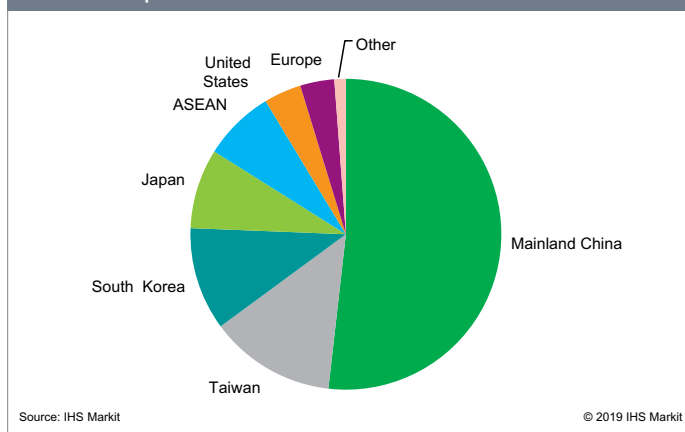
The global market for chemicals used in the production of printed circuit boards (PCBs) and semiconductor packaging materials is expected to grow at an average annual rate of 4–5% through 2024. China will have the fastest growth rate at about 7.5% per year, followed by the ASEAN countries and Taiwan, while North America, Western Europe, and Japan will have lower growth rates.

PCBs are the backbone of electronic products. They are used to support and connect electronic components in all electronic applications. The PCB manufacturing process has basic steps such as etching, laminating, drilling, electroplating, lithographing, and screen printing. Many chemicals and materials are used in these steps. After all of these steps are completed, the PCB is tested, populated with components, and incorporated into the final electronic product.

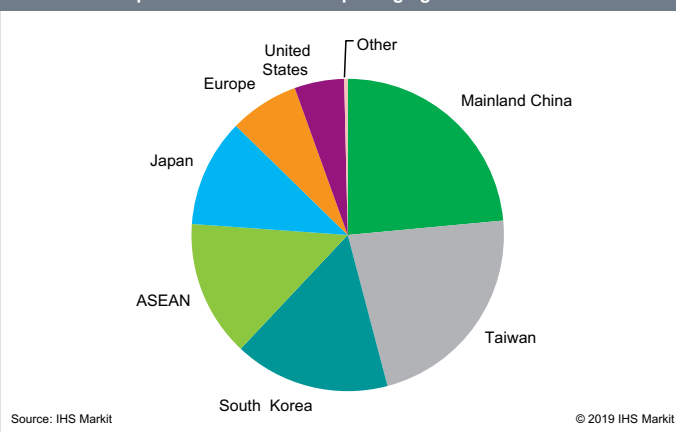
Semiconductor packages serve to protect integrated circuits (ICs) during shipping and handling and to dissipate heat. The semiconductor packaging market is closely linked to the PCB manufacturing market because packages allow the die to be mounted on the PCB. Demand for packaging has been driven by the miniaturization of ICs, higher PCB board density and 3-D packaging. In addition, demand for packaging materials is expected to grow as the Internet of Things (IoT) increases the need for sensors and other ICs.

The following pie charts show world consumption of PCB chemicals and semiconductor packaging materials.

World consumption of PCB chemicals—2018



World consumption of semiconductor packaging materials—2018



Just a few of the global issues for the electronic chemicals industry are mentioned in the following paragraphs.

Regulations. Chemical and materials suppliers continue to face more restrictive environmental regulations globally. Existing regulations such as RoHS (Restriction of Hazardous Substances) and REACH (Registration, Evaluation, Authorization and Restriction of Chemicals) impact almost all aspects of the electronics industry. RoHS calls for the

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removal of metals such as lead, cadmium, mercury, bismuth, and chromium VI as well as polybrominated biphenyls (PBB) and ozone-depleting substances from all PCB and semiconductor packaging materials. With the exception of exempt applications, implementation of RoHS is well under way and most large global suppliers have already developed "green" alternatives. REACH monitors all chemicals produced in or imported into Europe and requires registration of all imported and produced material in excess of one metric ton per year, and evaluation of the environmental impact of these substances. Another EU regulation, the Waste Electrical and Electronic Equipment Directive (WEEE) requires companies to provide a process for collecting and recycling end-of-life electronic products.

Asia. The importance of Asia in the electronics industry cannot be overemphasized. Manufacturing capability in China, Taiwan, South Korea, and Japan make Asia the center of the electronics industry. Currently, almost all high-volume low-cost production of electronics is conducted in Asia.

Miniaturization. A greater number of transistors requires an increase in the number of I/O pin-outs on the board. The closer together the fine lines get, the higher is the requirement of the encapsulating material to insulate and protect them. Currently, most IC industry spending and production is focused on 13.5 nm nodes and smaller. The smallest node in mass production as of 2018 is 7 nm.

Globalization. The impact of globalization started to affect chemical markets in the mid-1990s. Only 15 years later, it became standard practice to design and develop a product in one country, manufacture it in another, and distribute it globally. Most successful semiconductor and electronic producers established factories in Asia and the materials suppliers followed the lead of their customers. At first it was the availability of low-cost labor and a young workforce that drove companies to Asia, but in the past 15 years, Asian companies have developed cutting-edge, technologically advanced manufacturing capabilities and large-scale manufacturing facilities.

Age of communication and information. Globalization is not just about selling goods and services across the globe. It is also about changing demographics and immigration patterns. Companies are now selling and sourcing goods, services, and labor all over the globe. This requires rapid, uninterrupted access to information on customers, products, services, markets, competitors, end users and more. The information needs to be timely and personalized. Populations are becoming more mobile and are moving to the centers of production. People want to communicate and collaborate with associates, friends, and families.

Board density and design complexity. Currently, the global growth of PCBs is being driven by the increased use of multilayered, flexible PCBs. The board density and design complexity keep increasing as electronic companies try to add more features to the product. Electronics designers are trying to design products with higher clock speeds. At higher speeds, speed and power dissipation become an issue requiring the use of advanced materials that can maintain their physical properties under ever-more-stressful conditions. At the same time, the electronics industry is extremely cost-sensitive. The properties of advanced materials and costs must be in balance.

Market demand. The chemical markets for PCB fabrication and semiconductor packaging are greatly influenced by the demand for products in the key markets. Some of the fastest-growing electronic markets are in communication and information using small wireless devices, including mobile phones and integrated devices like smartphones, and high-definition televisions. Computing products and computer peripherals, digital cameras and digital video cameras are the other markets expected to show high growth. The global broadcasting market is turning digital. Companies are spending on HDTV, 4K and 8K broadcast and production. In industrial applications, there is an increasing amount of electronic content in automobiles. Another promising growth area is in medical devices. Miniaturization allows for the creation of smaller more portable medical technology devices, such as in-home defibrillators.

The global market for chemicals consumed in the production of PCBs is expected to grow at an average annual rate of about 4.0% through 2024. China accounts for approximately 53% of the global market, followed by Taiwan, South Korea, Japan, ASEAN, North America, and Europe.

The global market for electronic chemicals consumed in semiconductor packaging materials is expected to grow at an average annual rate of about 5.5% through 2024. China accounts for 25% of the global market, followed by Taiwan, South Korea, ASEAN, Japan, Europe, and North America.

The global market for chemicals used in the production of printed circuit boards (PCBs) and semiconductor packaging materials is expected to grow at an average annual rate of 4–5% through 2024. China will have the fastest growth rate at about 7.5% per year, followed by ASEAN and Taiwan, while North America, Western Europe, and Japan will have lower growth rates.

For more detailed information, see the table of contents, shown below.

IHS Markit's Specialty Chemicals Update Program – *Electronic Chemicals: PCB Chemicals and Semiconductor Raw Materials* is the comprehensive and trusted guide for anyone seeking information on this industry. This latest report details global and regional information, including



Industry structure,
operating characteristics
and regulatory
environment



Products, functions
and markets



Cost structure/
profitability



Technology changes
and emerging
substitution practices



Quantitative market
analysis and forecasts

Key benefits

IHS Markit's Specialty Chemicals Update Program – *Electronic Chemicals: PCB Chemicals and Semiconductor Raw Materials* has been compiled using primary interviews with key suppliers and organizations, and leading representatives from the industry in combination with IHS Markit's unparalleled access to upstream and downstream market intelligence and expert insights into industry dynamics, trade, and economics.

This report can help you

- Identify the competitive environment and key players
- Assess key issues facing both suppliers and their end-use customers
- Understand industry integration strategies
- Keep abreast of industry structure changes, regulatory requirements, and other factors affecting profitability
- Identify new business opportunities and threats
- Follow important commercial developments
- Recognize trends and driving forces influencing specialty chemical markets

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