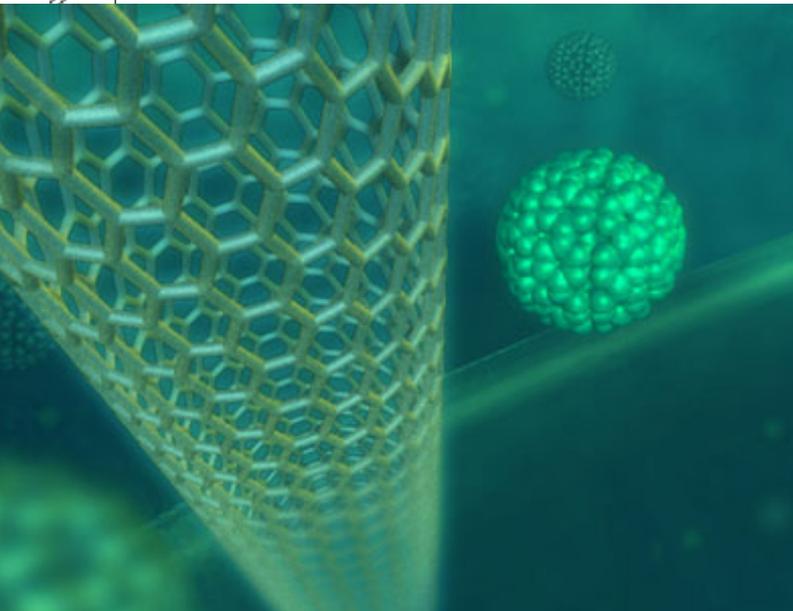


REVIEW

NANO in 2017

The market for nanotechnology and nanomaterials will continue to grow in 2017, with increased demand for products enabled by quantum dots, graphene, carbon nanotubes and other remarkable materials.

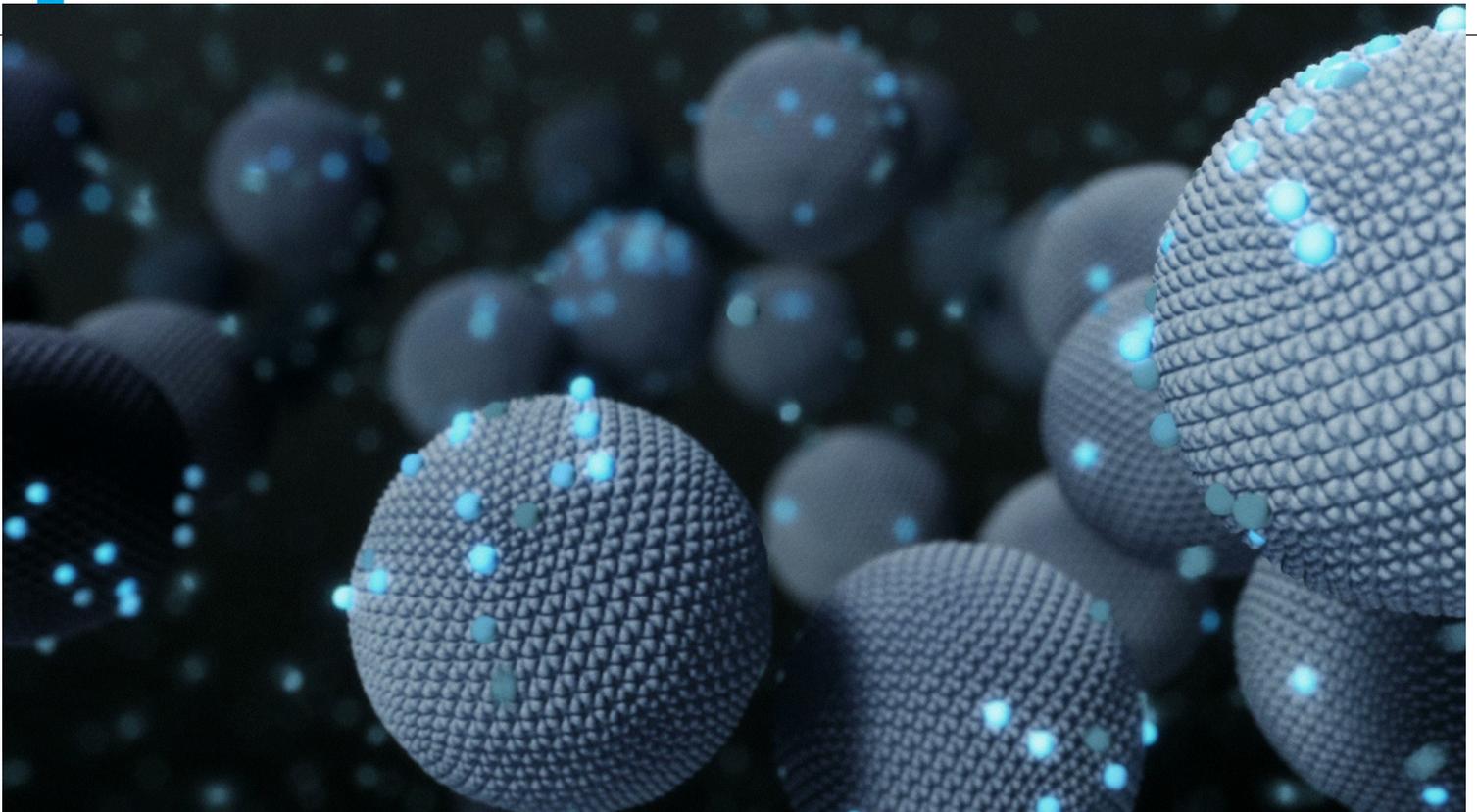


The development of advanced materials is crucial for technological progress. As we look towards “smart” technology to solve a number of global challenges, nanomaterials are increasingly becoming part of our daily lives and their importance will increase as miniaturization becomes more important in markets such as electronics, sensors, energy and biomedicine. Nanotechnology and nanomaterials allow for the improvement of functional characteristics of existing materials and products, as well as for the creation of radically new solutions in areas such as high-performance composites, flexible electronics and ultra-sensitive sensors.

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Nanocellulose

Today there is a substantial amount of research on nanocellulose and commercial development is on-going, including the construction of multi-ton capacity manufacturing facilities, mainly in North American, Japan and Europe. including the construction of multi-ton capacity manufacturing facilities, mainly in North American, Japan and Europe. The market for nanocellulose continues to grow with new products on the market in



in 2016 in packaging and new production facilities coming on stream in 2017 in Asia and Europe. Nanocellulose is a prime candidate for use as a sustainable material in industries such as packaging that typically involves the high-energy intensity production of chemicals and synthetic polymers.

initiatives worldwide. Beyond graphene, emerging elementary 2D materials such as black phosphorous, C2N and silicene will potentially allow for flexible electronics and field-effect transistors devices that exhibit ambipolar transport behaviour with either a direct band-gap or greater gate modulation.



Figure 1: Elopak packaging incorporating nanocellulose.

Image credit: Elopak.

Graphene

The market for graphene continues to expand, with new product launches, multi-million dollar funding for companies and start-ups and new government

However, relatively few graphene products have reached the market as yet, and until recently those that have mainly incorporate graphene additives to enhance toughness, conductivity and flexibility. This is likely to change in 2017 as products come onto the market in batteries, supercapacitors, conductive inks, coatings and composites.



Figure 2: Graphene supercapacitors.

Image credit: Skeleton Technologies.

Quantum dots

The quantum dots market has exploded recently. Several quantum dot producers have developed scalable solution production processes and partner with multinational OEMs to use QDs in displays for tablets and LCD-TVs. They have collaborated with companies such as Sony, Samsung, 3M, Amazon, Hisense and ASUS to bring QD-enabled display devices to market in the past 18 months. Samsung Electronics has witnessed significant market return from QD-TVs and recently announced investment in developing beyond OLED Quantum Dot LED (QLED) TVs and new initiatives in semiconductors and bio products, under a dedicated R&D unit. The company also recently unveiled a new range of QLED TVs and bought QD producer QD Vision for \$70 million. LG Display, the main producer of OLED TVs, is expanding its cooperation with QD material manufacturers Nanoco and Nanosys in a project to research new applications of QDs and QLED TVs.

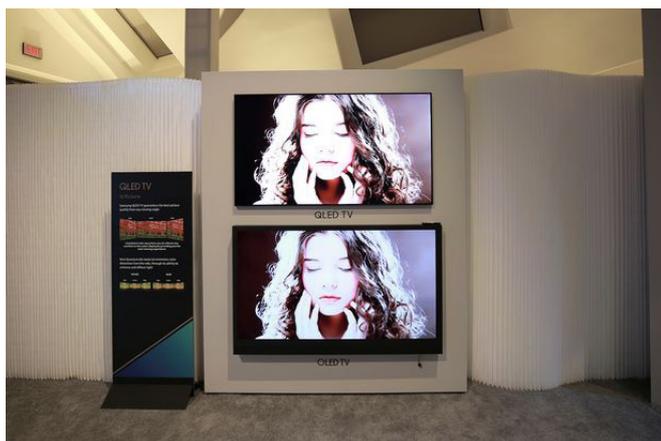


Figure 3: QLED-TVs.

Image credit: Samsung.

Carbon nanotubes

Carbon nanotubes (CNTs) have been attracted huge attention over the past two decades, based on their extraordinary physical and chemical properties that are a result of their intrinsic nano-sized one-dimensional (1D) nature. Once the most promising of all nanomaterials, CNTs face stiff competition in conductive applications from graphene and new 2D materials; and in mechanically enhanced composites from nanocellulose.

However, after considerable research efforts, numerous multi-walled carbon nanotubes (MWNTs)-enhanced products are commercially available. Super-aligned CNT arrays, films and yarns have found applications in consumer electronics, batteries, polymer composites, aerospace, sensors, heaters, filters and biomedicine. Recent lower-cost production of single-walled carbon nanotubes by Zeon Corporation and OCSiAl is also changing the commercial picture considerably and their wider application is expected in the next few years in composites, packaging, rubber and electronics.



Figure 4: Tuball nanotubes.

Image credit: OCSiAl

Nanocoatings

Already a multi-billion dollar revenue generator,

the market for nanocoatings will continue to grow in 2017 in packaging, anti-microbials, architectural, industrial manufacturing, marine, wood, auto refinish, transportation and protective coatings across numerous sectors. Construction, architecture and exterior protection is the main market for nanocoatings with photocatalytic nanocoatings a significant market, especially in Japan.

Application of anti-corrosion and super hardness nanocoatings is driving revenues in the oil and gas industry, for protective surfaces in pipelines and harsh environments and on drilling equipment. Automotive, packaging, solar PV, glass, oil and gas companies are finding that nanocoatings offer significant product performance and longer-term cost-saving advantages for consumers. The explosion of the smartphone market in the last few years has led to an increasing demand for a waterproof electronics. Nanocoatings companies such as HZO, DryWired and P2i have witnessed a huge increase in demand for their systems to waterproof electronic devices and this trend will continue in 2017.



Figure 5: P2i water-repellent nanocoating.

Image credit: P2i.

FURTHER INFORMATION

Nanotech Magazine

Published monthly

www.nanotechmag.com

Graphene Magazine

Published bi-monthly

www.2dmaterialsmag.com

The Nanotechnology and Nanomaterials Global Opportunity Report

[/www.futuremarketsinc.com/the-nanotechnology-and-nanomaterials-global-opportunity-report/](http://www.futuremarketsinc.com/the-nanotechnology-and-nanomaterials-global-opportunity-report/)

The Graphene and 2-D Materials Global Opportunity and Market Forecast 2017-2027 Report

www.futuremarketsinc.com/graphene-market

The Global Market for Quantum Dots 2017-2025

www.futuremarketsinc.com/the-global-market-for-quantum-dots-2/

The Carbon Nanomaterials Global Opportunity Report

www.futuremarketsinc.com/carbon-nanotubes-graphene-globalmarket/

The Nanocoatings Global Opportunity Report

www.futuremarketsinc.com/the-global-market-for-nanocoatings/