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Multifunctional Smart Coatings and Surfaces: 2016-2023

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Abstracts

n-tech believes that the coming decade will see substantial new business revenues generated by smart coatings that exhibit multiple functionalities. In fact, we are already seeing multifunctional coatings and surfaces reach actual commercialization:

> In the construction industry we have now reached the point where it is possible to fabricate smart windows that combine self-dimming, solar energy generation and self-healing into a single IGU
>
> In aerospace, some smart surfaces can monitor the structural health of wings and fuselage and then make modest repairs automatically
>
> In medicine, the development of coatings with antimicrobial and anti-inflammatory properties is of obvious importance. Here a group of researchers has already created a multifunctional coating on bioactive agents, which addresses both these issues together.

The multifunctional coatings opportunity is being shaped by the growing marketplace insistence that buildings, transportation, devices for providing healthcare and even complete cities be “smart.” In some cases multifunctional smart coatings and surfaces may improve functionality, while at the same time improving aesthetics

Coatings and surfaces that are smart in multiple ways would seem to fit better into the evolving need for “smarts” than garden varieties, of smart coatings. n-tech also sees in multifunctional coatings a considerable potential for coatings firms – both large, established firms and start-ups – to create significant market value, while differentiating

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themselves in the market.

Optimistic visions of a profitable multifunctional future for the coatings industry should be balanced not only against the need to match functions with market needs, but with the capabilities of materials and fabrication tools.

Some multifunctional coatings are already on the market, but others are not ready for prime time. Much the same can be said of tools, where there is currently a plethora of fabrication approaches to creating multifunctional surfaces – although some of them are not yet capable of covering the large areas required (say) by the walls of a building.

Objectives of this Report

Identifying how and where value will be created with multifunctional coatings. This report provides a technological roadmap for multifunctional smart coatings and surfaces, showing how they (1) can create value by drastically improving price/performance ratios and (2) establish entirely new smart product capabilities in many industry sectors, especially in automotive, aerospace, healthcare and medicine, and construction. We also examine how the technologies and applications in this sector are likely to evolve over the next ten years.

Assessment of which combinations of functionalities will be most successful in the marketplace. The report also looks at what are the most marketable combinations of functionality for each of the industry sectors discussed. In carrying out this analysis we examine how self-cleaning, self-healing, smart antimicrobial, color shifting, anticorrosion and photovoltaic functionality can be combined in different ways and for different market sectors.

Strategic profiles. This report also contains profiles of leading companies developing multifunctional smart materials. These include leading specialty chemical companies, glass firms and start-ups. We also examine how supply chains are evolving for their products and where important R&D projects seems to be taking us in terms of commercialization,

Ten-year forecasts. In the balance of the report we examine various end-user sectors, where multifunctional smart coatings and surfaces are already being used or will be in the near future. For each of these sectors we present an eight-year market forecast and also show how multifunctional smart products have a market fit with current sector wide trends. Specifically, we show which combinations of smart functionalities will be the

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most productive in terms of revenue generation.

Our forecasts of multifunctional coatings comprise detailed projections of volume (in square meters and units) and revenue (in $ millions), broken down by:

End user sector

Type of functionality and product

Material and technology

Coverage

In this report, we analyze the market for this emerging class of multifunctional smart coatings and related surfaces. The coverage includes:

Materials evolution. This report covers materials based on inorganic, organic and biological materials, as well as man-made materials – composites and metamaterials. It discusses product developments that will enable such materials to serve in a multifunctional market environment. As part of this analysis the report examines existing multifunctional coatings products as well as taking a peek at what is likely to emerge from notable labs in the next decade.

Multifunctionality represents an environment in which coatings may have to transcend conventional coatings technologies. The report looks at both multifunctionality delivered through multi-layered coatings as well as materials that are intrinsically multifunctional. And, although the focus of this report is on the market for coatings, we also discuss the competition between smart multifunctional materials and sensor-embedded surfaces.

Emerging fabrication approaches for multifunctional coatings. Both coatings synthesis and coatings applications are in a state of flux at the present time. The report discusses how fabrication and simulation approaches will better enable multifunctional coatings. Areas covered in this analysis will include novel techniques for coating synthesis, curing, characterization, and multiscale modeling, as well scaling up coating operations so that large surfaces can be better coated with multifunctional coatings. Applications and end-user markets for multifunctional coatings. This report identifies the applications areas where n-tech believes multifunctional coatings and surfaces have a real opportunity to move beyond the lab to high-volume commercial applications. In this

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report we discuss those areas where multifunctional coatings are already being used or are under serious consideration – the automotive industry, aerospace, healthcare and medicine, and construction.

We also analyze how multifunctional coatings will also be used in other industries such as textiles, electronics and consumer products. Among the topics considered are how specific coating technologies are being matched to the needs of multifunctional coatings for specific

Strategic profiles of key players. This report evaluates the product/market strategies of the leading suppliers in the multifunctional coatings and surfaces space. Firms that are discussed in this report include:

AGC

AkzoNobel

Alcoa

BASF

BigSky Technologies

Casalgrande

Clariant

Cornerstone Research

Corning

Covestro

Crossville

Diamon-Fusion

Dow Chemical

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Dow Corning

DSM Biomedical

DuPont

Essroc/Italcementi

Evonik

Faurecia

Fraunhofer IFM

Gelest

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Green Earth Nano Science

Guard

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