

# **Smartnanocoatings the key to advance efficiency in surface solutions, easy to clean super hydrophobic & super hydrophilic coatings**

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## **Preface**

Coatings products based on sol-gel chemistry and nanotechnology are developed for the use on Al and Mg metals & other materials with basic principles of synthesis route and chemistry of inorganic-organic hybrid polymers. The products provide excellent protection with thin layers and without the use of heavy metals. Additional properties can be included such as easy-to-clean properties due to hydrophilic and/or hydrophobic surfaces and protective coatings with new smart properties. Nanotecnologia Spain focus is on formulation & production of coatings for protection of surfaces, the company specialises in this area of study in collaboration with partner laboratories & research institutes. This presentation will be mainly looking at practical examples: hydrophobic solutions easy to clean surfaces on aluminium surfaces, coating for heat exchangers; coatings for refurbishment existing facades in military & civil installations; coatings for reinforced concrete such as cooling towers at energy plants. And hydrophilic solutions, auto clean surfaces & elimination of pollutants derived from exhaust engines in civil & military installations.

## **Introduction**

Inorganic polymers as film formers are in use for many years in paint technology. Mostly used are Zinc silicates as primer coatings in heavy duty corrosion protection. They were utilised as binder – typically hydrolysed tetra ethyl ortho silicate or alkali metal silicate. In the early 80's many investigations began to form interpenetrating organic-inorganic networks. The first work was done on epoxy polyamine network connected with polysiloxane network. The organic modification is critical in terms of resulting film properties and compatibility between the organic and inorganic moieties is not easy to achieve. If the level of organic modification is too low, the films are glasslike with good durability but other properties were generally poor. Too high a level of organic material show for example a too low UV stability. So, since the 90's more progress was made in the development of new ways to synthesise novel hybrid polymers that can be used as resins for the formulation of paint materials with low coating thickness and enhanced properties. Effects and possibilities are attributable primarily to the ratio of surface to volume atoms and the quantum mechanical properties of the components. By varying the composition, shape, size or character of the surface, these nano particles can be shaped again and again like small building blocks, resulting in unprecedented scope for material design. The decisive factor is that new mechanical, optical, magnetic, electrical and chemical characteristics and properties can result from the nano-scale nature of the system components. With this technology new materials can be designed for the macroscopic world, providing new materials for the future with many possibilities.

A union between substrate and coating that is produced is made possible by structures in the coating material that are very similar to those of the material surface. Substrate and coating thus enter into real, covalent chemical bonds with each other. Surface and coating grow into an inorganic polymer network at molecular level.