SMART SUPERHYDROPHOBIC SURFACES AND SEPARATIONS

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Coatings are an integral part of modern society since they provide both barrier and packaging applications in its basic function. Many types and classifications of coatings can be differentiated by formulation, methods of deposition, or by industry. Their methods of coating are commensurate with their intended application. However, it is useful to think that coatings are essentially nanoscopic phenomena that have been translated to macroscopic visibility. Although nanoscopic events can either multiply into improved performance (synergistic) or failure (non-synergistic).

The research and development of smart surfaces and coatings capable of stimuli-response or omni behavior represents an important development for coatings in any major application. The ability to control wetting through nanostructuring and choice of chemical functionality can be supplemented by the right deposition methods or application of both lithographic and non-lithographic printing methods. In this talk, we will give important examples in our lab of nanostructuring and surface chemical modification methods resulting in: 1) superhydrophobic and superlipophilic films, 2) oil and water separations, 3) anti-microbial properties, 3) de-icing properties. These properties have in fact been observed in one type of film formation and material alone. Templating with colloidal properties will also be reported.

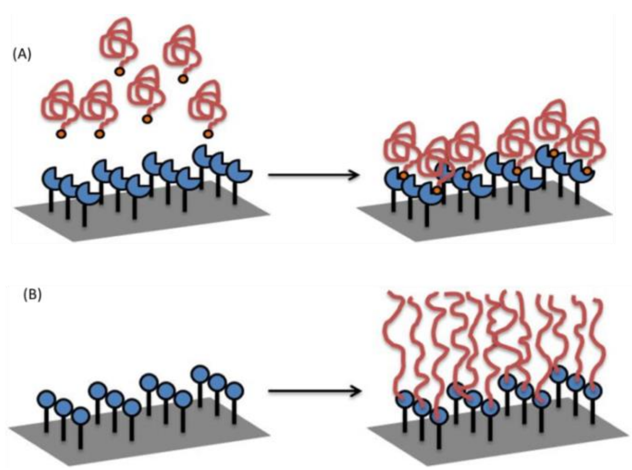

Figure 1. *(A). Scheme for the preparation of polymer brushes via chemisorption reaction of end-functionalized polymers with complementary functional groups at the substrate surface ("Grafting-to" approach).(B) Synthetic strategies for the preparation of polymer brushes grown via SIP technique ("Grafting-from" approach).*

PERSPECTIVE

It is possible that different types of coating methods and materials will have identifiable features that can be modified all the way to the nanoscale. The use of nanoparticles to induce hierarchical roughness, nanofibers to improve mechanical strength, nanoporogens to create more open cell structures in membranes, etc. - are asymmetrical and 3-Dimensional modes for nanostructured coatings. Equally important is the application of novel analytical tools to characterize the new structures or quantify the phenomenon that is to be examined. Many of these surface sensitive spectroscopic and microscopic analytical tools are best done at the interface and ultrathin film thickness format. Many 2-Dimensional models and layering methods at the ultrathin level will allow better characterization and understanding of the 3-D equivalent. Therefore, early directed investigations at the 2-D and ultrathin scale for applications are ultimately useful in translating these properties towards performance and productization goals. This may be perhaps a model for bridging the science and engineering of coatings - coming from universities and translating it towards commercialization of new smart coating technologies.

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