Amphiphilic polymers at interfaces

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Self-assembly phenomena in block copolymer systems are attracting considerable interest from the scientific community and industry alike. Particularly interesting is the behavior of amphiphilic copolymers, which can self-organize to nanoscale-sized objects such as micelles, vesicles, or tubes in solution, and which form well-defined assemblies at interfaces such as air–liquid, air–solid, or liquid–solid. Depending on the polymer chemistry and architecture, various types of organization at interfaces can be expected, and further exploited for applications in nanotechnology, electronics, and biomedical sciences. In this article, we discuss the formation and characterization of Langmuir monolayers from various amphiphilic block copolymers, including chargeable and thus pH-responsive materials. Solid-supported polymer films are reviewed in the context of alteration of surface properties by ultrathin polymer layers and the possibilities for application in tissue engineering, sensors and biomaterials. Finally, we focus on how organic and polymer monolayers influence the growth of inorganic materials. This is a truly biomimetic approach since Nature uses soft interfaces to control the nucleation, growth, and morphology of biominerals such as calcium phosphate, calcium carbonate, and silica.

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