
ALD-induced Blending of Polymers with Ceramics for novel Functional Hybrids

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Mineralization of inorganic materials in (bio)polymers became one of the most fruitful approaches towards designing materials with outstanding properties in the past decades. The concept of biomimetalization is adapted from nature and has witnessed numerous fascinating developments, which in many cases have changed our lives. Among those functional materials hybrid materials play an increasingly important role. Hybrid materials are in most cases blends of inorganic and organic materials and are considered to be key for the next generation of materials research. The main goal while fabricating such materials is to bridge the worlds of polymers and ceramics, ideally uniting the most desirable properties within a singular material.

In our work, we extend the concept of biomineralization towards fabrication of (bio)polymer-inorganic hybrid materials by applying a solvent-free vapor phase infiltration (VPI) process rather than making use of wet chemistry. The VPI process can be seen as a chemical reactor that allows precise dosing of a chemical, allowing for chemical interaction and modification of the subsurface area of a substrate.

In this talk, some approaches will be discussed that show great promise for establishing VPI as the method-of-choice for innovation. The VPI process allows infusing metals or ceramics into polymeric substrates, which leads to novel material blends that cannot easily be obtained in other ways. The chemical or physical properties of the initial substrate are improved or new functionalities added. With some showcases, this talk will discuss approaches towards fabrication of novel materials with great promise in personal protection or flexible electronics.