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Layer-by-Layer Covalent Assembly of Reactive Ultrathin Films

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WARF: P08130US

Inventors: David Lynn, Maren Buck, Jingtao Zhang

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing covalently cross-linked reactive thin films fabricated using azlactone functionalized polymers.

Overview

Methods that allow reactive polymer films to be deposited or assembled on topologically complex substrates are useful for the patterning or chemical modification of surfaces in a broad range of applications. Aqueous methods for the layer-by-layer deposition of oppositely charged polyelectrolytes are used widely for the assembly of thin polymer films. These methods generally take advantage of weak interactions between the polyelectrolytes and the oppositely charged surfaces, and the stability of the resulting thin films depends on the nature of these weak interactions and the extent to which they can be disrupted by changes in environmental conditions. The stability of thin polymer films could be enhanced by chemically cross-linking the polyelectrolyte components after fabrication.

The Invention

UW–Madison researchers have developed robust methods for the layer-by-layer fabrication of covalently cross-linked ultrathin films. This approach makes use of fast and efficient “click”-type interfacial reactions between poly(2-alkenyl azlactone)s and appropriately functionalized polyamines. In contrast to conventional, aqueous methods for the layer-by-layer fabrication of thin films, fabrication of these ultrathin films occurs in organic solvents and is driven by rapid formation of covalent bonds during assembly. This approach also yields films with residual azlactone groups that can be used to tailor the surface properties of the films by treatment with a broad range of chemical and biological functionalities.

Applications

- Non-wetting surfaces for use in self-cleaning applications, non-fouling surfaces and membranes for separations
- Coatings for instruments, including medical devices and disposable research tools such as pipette tips, tubes or petri dishes
- Surfaces that prevent or promote adhesion of cells or proteins
- Other applications may include tissue engineering or catalysis

Key Benefits

- Enables precise, nanometer-scale control over thicknesses and compositions of covalently cross-linked thin films
- Reactivity of these cross-linked films allows them to be further functionalized with chemical and biological compounds to modify or pattern film properties.
- Ultrathin films can be freestanding or surface-attached.
- Films may be hydrophilic, hydrophobic or a mixture of both.
- Suitable for organic and inorganic surfaces with complex topographies

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Publications

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WARF
Wisconsin Alumni Research Foundation

| info@warf.org | 608.960.9850

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Tech Fields

- [Drug Delivery : Other drug delivery technologies](#)
- [Materials & Chemicals : Polymers](#)
- [Medical Devices : Device coatings](#)

For current licensing status, please contact Michael Carey at mcarey@warf.org or 608-960-9867

Figures

