LAYER-BY-LAYER COATING APPARATUS AND METHOD

TECHNICAL FIELD

The disclosure relates to an apparatus for layer-by-layer coating as well as methods of layer-by-layer coating.

BACKGROUND

Layer-by-layer (sometimes known as LBL) coating is known in the art, and was traditionally performed by a dip-coating technique wherein a substrate was dipped in a polycation solution to deposit a monolayer of polycation. The substrate was removed from the polycation solution, rinsed to remove excess polycation, dipped into a polyanion solution to deposit a monolayer of polyanion, removed from the polyanion solution, and finally rinsed again to remove excess polyanion. The result of that process was a bilayer deposited on a surface of the substrate. The process could be repeated to obtain the desired number of bilayers.

A variety of substances have been used for the various monolayers of the LBL bilayer. Typically, the two monolayers are chosen so that each of the monolayers binds or adheres only to the other monolayer (and, in the case of the first deposited monolayer, to the substrate) but not to itself.

SUMMARY

An apparatus can comprise a first roller for moving a belt and a second roller for moving a belt. The apparatus can include a belt having a first major surface and a second major surface tensioned around the first roller and the second roller. A first deposition station can be positioned to face belt, the first deposition station comprising a first self-limiting monolayer forming material depositing element for affixing a monolayer of a first self-limiting monolayer forming material to the belt. A first directional gas curtain producing element can be positioned downstream from the first deposition station.

In one aspect, there is provided an apparatus comprising a first roller for moving a belt; a second roller for moving a belt; a belt having tensioned around the first roller and the second roller; a first deposition station positioned to face the belt, the first deposition station comprising a first self-limiting monolayer forming material depositing element for affixing a monolayer of a first self-limiting monolayer forming material to the belt, a first directional gas curtain producing element positioned downstream from the first deposition station to provide a gas curtain blowing the belt.

A second deposition station that is different from the first deposition station can optionally be employed in which case it can be positioned to face the outside surface of the belt, the second deposition station comprising a second self-limiting monolayer forming material depositing element for affixing a monolayer of a second self-limiting monolayer forming material to the belt. The second deposition can be downstream of the first deposition station and downstream from the first directional

gas curtain producing element. A second directional gas curtain producing element can be positioned downstream from the second deposition station to face the outside of the surface of the belt to provide a gas curtain blowing on the outside surface of the belt.

In another aspect, there is provided a method of making a coating on a substrate, the method comprising (a) tensioning a substrate in the form of a belt around a first roller and a second roller such that at least a portion of the belt faces a first deposition station, the first deposition station comprising a first self-limiting monolayer forming material depositing element for affixing a monolayer of a first self-limiting monolayer forming material to the belt, (b) moving the belt around the first roller and the second roller while engaging the first self-limiting monolayer forming material depositing element to apply a first liquid comprising a first self-limiting monolayer forming material on the belt; (c) engaging a first directional gas curtain producing element that is positioned downstream from the first deposition station to provide a gas curtain that simultaneously meters and dries the first liquid on the belt while leaving at least a monolayer of first self-limiting monolayer forming material on the belt.

BRIEF DESCRIPTION OF THE FIGURES

Figure 1 is a schematic of an apparatus as described herein;