film includes a conductive polymer. Conductive polymers can typically be susceptible to moisture and other environmental factors, especially at elevated temperatures. A thin dielectric coating may not be able to sufficiently protect a conductive polymer film against environmental factors such as moisture. This lack of protection can, for example, be due to the porosity of the dielectric coating or coating defects that can result in pinholes in the dielectric coating. According to one aspect of the present invention, a self-supporting flexible glass layer can protect a conductive film that includes a conductive polymer against adverse environmental factors such as moisture.

[0029] As yet another application, a touch sensor according to one aspect of the present invention can be employed to protect the active layers in an Organic Light Emitting Display (OLED). Typically, the active layers in an OLED device can substantially degrade when exposed to environmental factors such as moisture and/or oxygen, especially at elevated temperatures. Typically, a glass layer can be used to protect the active layers. A capacitive touch sensor according to one aspect of the present invention can be utilized to protect the active layers in an OLED device against environmental and other factors. For example, according to one aspect of the invention, a self-supporting flexible glass layer can replace the glass layer that could otherwise be used to protect the active layers.

[0030] In general, the current invention can be utilized in any application where it may be desirable to protect one or more layers in a touch sensor or a touch display system from abrasions, scratches, environmental factors such as moisture and oxygen, or any other extraneous factor against which a thin dielectric coating may not be able to sufficiently protect.

[0031] **FIG. 1** illustrates a capacitive touch sensor **100** in accordance with one particular embodiment of the present invention. Capacitive touch sensor **100** includes a substrate **110**, an electrically continuous optically transparent conductive film **120**, an optional optically transparent bonding layer **150**, and an optically transparent glass layer **160**.

[0032] Glass layer **160** can be any type of optically transparent glass. Exemplary glass materials include soda lime glass, borosilicate glass, borate glass, silicate glass, any oxide glass and silica glass. Glass layer **160** is preferably flexible, meaning that the glass layer is sufficiently thin that it can be bent without structurally damaging the layer. Glass layer **160** is preferably thin enough to be capable of bending to a radius of curvature ranging from 1500 to 600 mm, and more preferably to a range of 1400 to 500 mm, and even more preferably to a range of 1200 to 400 mm. In one aspect of the invention, glass layer **160** has a thickness preferably in the range of 0.1 to 2.0 mm, and more preferably in the range of 0.3 to 1.5 mm, and even more preferably in the range of 0.5 to 1.0 mm. Furthermore, glass layer **160** is preferably self-supporting. According to the present invention, a self-supporting layer is a film that can sustain and support its own weight without breaking, tearing, or otherwise being damaged in a manner that would make it unsuitable for its intended use.

[0033] The electrically continuous optically transparent conductive film **120** can be a metal, semiconductor, doped semiconductor, semi-metal, metal oxide, an organic conductor, a conductive polymer, and the like. Exemplary metal conductors include gold, copper, silver, and the like. Exemplary inorganic materials include transparent conductive oxides, for example indium tin oxide (ITO), fluorine doped tin oxide, tin antimony oxide (TAO), and the like. Exemplary organic materials include conductive polymers such as polypyrrole, polyaniline, polyacetylene, and polythiophene, such as those disclosed in European Patent Publication EP-1-172-831-A2. The sheet resistance of the conductive film **120** can be in the range of 50 to 100,000 Ohms/square. The sheet resistance of the conductive film **120** is preferably in the range of 100 to 50,000 Ohms/square, and more preferably in the range of 200 to 10,000 Ohms/Square, and even more preferably in the range of 500 to 4,000 Ohms/Square.

[0034] The exemplary touch sensor **100** defines a touch sensitive area **195**. According to the present invention, electrically continuous optically transparent conductive film **120** preferably covers the touch sensitive area **195**. In some applications, film **120** can cover a portion of the touch sensitive area. In some other applications, film **120** can cover more than the touch sensitive area as illustrated in **FIG. 1**. In yet some other applications, film **120** can cover a portion of the touch sensitive area and extend into areas not sensitive to touch.

[0035] A particular advantage of the present invention is that glass layer **160** is sufficiently thin to allow detection of a signal induced by capacitive coupling between a conductive touch implement and the conductive film **120**. At the same time, according to the present invention, glass layer **160** is thick enough to make the layer self-supporting and processable. Furthermore, glass layer **160** is thick enough so that abrasion due to, for example, normal use results in fewer or no cosmetic defects such as discoloration that would normally occur when the thickness of layer **160** is on the order of a few wavelengths. In addition, glass layer **160** is thick enough to protect the conductive film **120** from damage, such as a deep scratch in the glass layer, which may result from a user's fingernail, a coin, a pen, or any sharp touch input applied to the touch sensitive area **195**.

[0036] Another particular advantage of the present invention is that layer **160** includes glass. A layer similar to layer **160** in thickness, but made of organic materials such as polycarbonate, acrylic, polyethylene terephthalate (PET), polyvinyl chloride (PVC), polysulfone, and the like, would be much softer than glass and therefor, more susceptible to scratches. For example, according to a pencil hardness test (see ASTM D **3363**, Test Method for Film Hardness by Pencil Test) PET has a pencil hardness of about 1H, whereas glass has a much higher hardness of about 6H. According to the present invention, layer **160** includes glass to protect conductive layer **120** from damage, and is preferably flexible to make it more processable. A flexible layer **160** often means a thin layer **160**. Therefore, according to one aspect of the present invention, flexible layer **160** is sufficiently thin so that signals induced by capacitive coupling between a conductive touch implement and a conductive film **120** are sufficiently large to make the induced signal detectable and differentiable from background noise so that the touch location can be adequately determined.

[0037] Another advantage of the present invention is low temperature processing. Conventional capacitive touch sensors typically use a thin sol-gel based silica coating to protect the conductive film. The sol-gel coating can often