$N(R^5)$-R_S, as described above. The protective (co)polymer layer includes the reaction product of at least one of the foregoing diurethane (meth)acrylate-silane precursor compounds of the formula R_A-NH-C(O)-O-C(R^{12} R^{13})-C($R^{14}R^{15}$)-[C($R^{16}R^{17}$)]$_a$-O-C(O)-$N(R^5)$-R_S, as described above.

In another aspect, the present disclosure describes an article, comprising: a substrate selected from a (co)polymeric film or an electronic device, the electronic device further comprising an organic light emitting device (OLED), an electrophoretic light emitting device, a liquid crystal display, a thin film transistor, a photovoltaic device, or a combination thereof; a base (co)polymer layer on a major surface of the substrate; an oxide layer on the base (co)polymer layer; and a protective (co)polymer layer on the oxide layer, wherein the protective (co)polymer layer comprises ~~the~~ a reaction product of at least one diurethane (meth)acrylate-silane precursor compound of the formula: R_A-NH-C(O)-O-C(R^{12} R^{13})-C($R^{14}R^{15}$)-[C($R^{16}R^{17}$)]$_a$-O-C(O)-$N(R^5)$-R_S, wherein: R_A is a (meth)acryl group containing group of the formula R^{11}-$(A)_n$, further wherein: R^{11} is a polyvalent alkylene, arylene, alkarylene, or aralkylene group, said alkylene, arylene, alkarylene, or aralkylene groups optionally containing one or more catenary oxygen atoms, A is a (meth)acryl group comprising the formula X^2-C(O)-C(R^3)=CH_2, additionally further wherein: X^2 is -O, -S, or –NR^3, R^3 is independently H, or C_1-C_4, and n=1 to 5; each R^{12}, R^{13}, R^{14}, R^{15}, R^{16}, and R^{17} is independently H, a linear, branched or cyclic alkyl group of 1 to 6 carbon atoms optionally comprising 1 to 3 catenary oxygen, sulfur, or nitrogen atoms, and optionally substituted with one or more hydroxyl groups; R_S is a silane containing group of the formula -R^1-[Si(Y_p)(R^2)$_{3-p}$]$_q$, wherein: R^1 is a polyvalent alkylene, arylene, alkarylene, or aralkylene group, said alkylene, arylene, alkarylene, or aralkylene group optionally containing one or more catenary oxygen atoms, Y is a hydrolysable group, R^2 is a monovalent alkyl or aryl group, p is 1,2, or 3, and q is independently 1 to 5; R^5 is H, C_1 to C_6 alkyl, C_1 to C_6 cycloalkyl, or R_S; and a is 0, 1, or 2.

In certain presently preferred exemplary embodiments of the foregoing articles, the substrate is a (co)polymeric film. In some exemplary embodiments of any of the foregoing articles, the substrate is a flexible transparent (co)polymeric film, optionally wherein the substrate comprises polyethylene terephthalate (PET), polyethylene napthalate (PEN), heat stabilized PET, heat stabilized PEN, polyoxymethylene, polyvinylnaphthalene, polyetheretherketone, a fluoro(co)polymer, polycarbonate, polymethylmethacrylate, poly α-methyl styrene, polysulfone, polyphenylene oxide, polyetherimide, polyethersulfone,

The disclosure also describes a process including: (a) applying a base (co)polymer layer to a major surface of a substrate, (b) applying an oxide layer on the base (co)polymer layer, and (c) depositing on the oxide layer a protective (co)polymer layer, wherein the protective (co)polymer layer includes a (co)polymer formed as the reaction product of at least one of the foregoing diurethane (meth)acrylate-silane precursor compound of the formula R_A-NH-C(O)-O-C(R^{12} R^{13})-C($R^{14}R^{15}$)-[C($R^{16}R^{17}$)]$_a$-O-C(O)-N(R^5)-R_S, as described above. The substrate is selected from a (co)polymeric film or an electronic device, the electronic device further including an organic light emitting device (OLED), an electrophoretic light emitting device, a liquid crystal display, a thin film transistor, a photovoltaic device, or a combination thereof.

In another aspect, the present disclosure provides a process, comprising: (a) applying a base (co)polymer layer to a major surface of a substrate selected from a (co)polymeric film or an electronic device, the electronic device further comprising an organic light emitting device (OLED), an electrophoretic light emitting device, a liquid crystal display, a thin film transistor, a photovoltaic device, or a combination thereof; (b) applying an oxide layer on the base (co)polymer layer; and (c) depositing on the oxide layer a protective (co)polymer layer, wherein the protective (co)polymer layer comprises ~~the~~ a reaction product of at least one diurethane (meth)acrylate-silane precursor compound of the formula: R_A-NH-C(O)-O-C(R^{12} R^{13})-C($R^{14}R^{15}$)-[C($R^{16}R^{17}$)]$_a$-O-C(O)-N(R^5)-R_S, wherein: R_A is a (meth)acryl group containing group of the formula R^{11}-(A)$_n$, further wherein: R^{11} is a polyvalent alkylene, arylene, alkarylene, or aralkylene group, said alkylene, arylene, alkarylene, or aralkylene groups optionally containing one or more catenary oxygen atoms, A is a (meth)acryl group comprising the formula X^2-C(O)-C(R^3)=CH_2, additionally wherein: X^2 is -O, -S, or –NR^3, and R^3 is independently H, or C_1-C_4, and n=1 to 5; each R^{12}, R^{13}, R^{14}, R^{15}, R^{16}, and R^{17} is independently H, a linear, branched or cyclic alkyl group of 1 to 6 carbon atoms, optionally comprising 1 to 3 catenary oxygen, sulfur, or nitrogen atoms, and optionally substituted with one or more hydroxyl groups; and R_S is a silane containing group of the formula -R^1-[Si(Y_p)(R^2)$_{3-p}$]$_q$, wherein: R^1 is a polyvalent alkylene, arylene, alkarylene, or aralkylene group, said alkylene, arylene, alkarylene, or aralkylene group optionally containing one or more catenary oxygen atoms, Y is a hydrolysable group, R^2 is a monovalent alkyl or aryl group; p is 1,2, or 3, and q is independently 1 to 5; R^5 is H, C_1 to C_6 alkyl, C_1 to C_6 cycloalkyl, or R_S; and a is 0, 1, or 2.

3. A composition of matter according to claim 2, wherein at least some of the hydrolysable groups Y are alkoxy groups.

4. An article, comprising:

a substrate selected from a (co)polymeric film or an electronic device, the electronic device further comprising an organic light emitting device (OLED), an electrophoretic light emitting device, a liquid crystal display, a thin film transistor, a photovoltaic device, or a combination thereof;

a base (co)polymer layer on a major surface of the substrate;

an oxide layer on the base (co)polymer layer; and

a protective (co)polymer layer on the oxide layer, wherein the protective (co)polymer layer comprises ~~the~~ a reaction product of at least one diurethane (meth)acrylate-silane precursor compound of the formula:

$$R_A\text{-NH-C(O)-O-C}(R^{12}R^{13})\text{-C}(R^{14}R^{15})\text{-}[C(R^{16}R^{17})]_a\text{-O-C(O)-N}(R^5)\text{-}R_S,$$

wherein:

R_A is a (meth)acryl group containing group of the formula $R^{11}\text{-}(A)_n$, further wherein:

R^{11} is a polyvalent alkylene, arylene, alkarylene, or aralkylene group, said alkylene, arylene, alkarylene, or aralkylene groups optionally containing one or more catenary oxygen atoms,

A is a (meth)acryl group comprising the formula $X^2\text{-C(O)-C}(R^3)=CH_2$, additionally further wherein:

X^2 is -O, -S, or $-NR^3$,

R^3 is independently H, or $C_1\text{-}C_4$, and

n=1 to 5;

each R^{12}, R^{13}, R^{14}, R^{15}, R^{16}, and R^{17} is independently H, a linear, branched or cyclic alkyl group of 1 to 6 carbon atoms optionally comprising 1 to 3 catenary oxygen, sulfur, or nitrogen atoms, and optionally substituted with one or more hydroxyl groups;

R_S is a silane containing group of the formula $\text{-}R^1\text{-}[Si(Y_p)(R^2)_{3\text{-}p}]_q$, wherein:

R^1 is a polyvalent alkylene, arylene, alkarylene, or aralkylene group, said alkylene, arylene, alkarylene, or aralkylene group optionally containing one or more catenary oxygen atoms,

Y is a hydrolysable group,

R^2 is a monovalent alkyl or aryl group

p is 1,2, or 3, and

q is independently 1 to 5;

R^5 is H, C_1 to C_6 alkyl, C_1 to C_6 cycloalkyl, or R_S; and

a is 0, 1, or 2.

5. The article of claim ~~3 or~~ 4, wherein each hydrolysable group Y is independently selected from an alkoxy group, an acetate group, an aryloxy group, and a halogen.

6. The article of claim 5, wherein at least some of the hydrolysable groups Y are alkoxy groups.

7. The article of any one of claims 4-6, further comprising a plurality of alternating layers of the oxide layer and the protective (co)polymer layer on the base (co)polymer layer.

8. The article of any one of claims 4-7, wherein the substrate comprises a flexible transparent (co)polymeric film, optionally wherein the substrate comprises polyethylene terephthalate (PET), polyethylene napthalate (PEN), heat stabilized PET, heat stabilized PEN, polyoxymethylene, polyvinylnaphthalene, polyetheretherketone, fluoro(co)polymer, polycarbonate, polymethylmethacrylate, poly α-methyl styrene, polysulfone, polyphenylene oxide, polyetherimide, polyethersulfone, polyamideimide, polyimide, polyphthalamide, or combinations thereof.

9. The article of any one of claims 4-8, wherein the base (co)polymer layer comprises an acrylate smoothing layer.

10. The article of any one of claim 4-9, wherein the oxide layer comprises oxides, nitrides, carbides or borides of atomic elements from Groups IIA, IIIA, IVA, VA, VIA, VIIA, IB, or IIB, metals of Groups IIIB, IVB, or VB, rare-earth metals, or combinations thereof.

11. The article of any one of claims 4-10, further comprising an oxide layer applied to the protective (co)polymer layer, optionally wherein the oxide layer comprises silicon aluminum oxide.

12. An electronic device incorporating the article according to any one of claims 4-11, wherein the substrate is a (co)polymer film and the electronic device is selected from a solid state lighting device, a display device, and combinations thereof.

13. An electronic device according to claim 12, wherein the solid state lighting device is selected from a semiconductor light-emitting diode device, an organic light-emitting diode device, and a polymer light-emitting diode device.

14. An electronic device according to claim 12, wherein the display device is selected from a liquid crystal display device, an organic light-emitting display device, and a quantum dot liquid crystal display device.

15. A process, comprising:

(a) applying a base (co)polymer layer to a major surface of a substrate selected from a (co)polymeric film or an electronic device, the electronic device further comprising an organic light emitting device (OLED), an electrophoretic light emitting device, a liquid crystal display, a thin film transistor, a photovoltaic device, or a combination thereof;

(b) applying an oxide layer on the base (co)polymer layer; and

(c) depositing on the oxide layer a protective (co)polymer layer, wherein the protective (co)polymer layer comprises ~~the~~ a reaction product of at least one diurethane (meth)acrylate-silane precursor compound of the formula:

$$R_A\text{-}NH\text{-}C(O)\text{-}O\text{-}C(R^{12}R^{13})\text{-}C(R^{14}R^{15})\text{-}[C(R^{16}R^{17})]_a\text{-}O\text{-}C(O)\text{-}N(R^5)\text{-}R_S,$$

wherein:

R_A is a (meth)acryl group containing group of the formula $R^{11}\text{-}(A)_n$, further wherein:

R^{11} is a polyvalent alkylene, arylene, alkarylene, or aralkylene group, said alkylene, arylene, alkarylene, or aralkylene groups optionally containing one or more catenary oxygen atoms,

A is a (meth)acryl group comprising the formula $X^2\text{-}C(O)\text{-}C(R^3)=CH_2$, additionally wherein:

X^2 is -O, -S, or $-NR^3$, and

R^3 is independently H, or C_1-C_4, and

n=1 to 5;