WHAT IS CLAIMED IS:

1. A coated substrate comprising:

a coating that includes a water insoluble polymer and a water soluble polymer; and

a substrate covered by the coating~~;~~, wherein the water insoluble polymer is poly(3,4-ethelynedioxythiophene) ("PEDT"), and the water soluble polymer is poly(styrene sulfonic acid) ("PSSH"), the coated substrate is prepared by a method including the following steps:

providing an aqueous dispersion containing PEDT and PSSH,

applying the aqueous dispersion onto a surface of a substrate, and

~~wherein the two polymers~~ allowing the applied aqueous dispersion to dry to form, due to different water ~~affinity,~~ affinities of the two polymers, on the surface of the substrate ~~form~~ a nanosegregant having a thickness of 1-10 nm~~.~~ capable of capturing a water film having a thickness of 0.1-10 mm, wherein the nanosegregant includes a water-insoluble layer containing both PEDT and PSSH and a water-soluble layer also containing both PEDT and PSSH.

~~2. The coated substrate of claim 1, wherein the water soluble polymer includes carboxylic groups.~~

~~3. The coated substrate of claim 1, wherein the water soluble polymer includes sulfonic groups.~~

~~4. The coated substrate of claim 1, wherein the water insoluble polymer includes aniline groups.~~

~~5. The coated substrate of claim 1, wherein the water insoluble polymer includes thiophene groups.~~

~~6. The coated substrate of claim 5, wherein the water soluble polymer includes sulfonic groups.~~

~~7. The coated substrate of claim 6, wherein the water insoluble polymer is poly(3,4-ethelynedioxythiophene) ("PEDT") and the water soluble polymer is poly(styrene sulfonic acid) ("PSSH").~~

~~8.~~2. The coated substrate of claim ~~7~~ 1, wherein the ratio between PEDT and PSSH is 1:2.5 to 1:20 by weight.

~~9.~~3. The coated substrate of claim ~~8~~ 2, wherein the ratio between PEDT and PSSH is 1:6 by weight.

~~10.~~4. The coated substrate of claim 1, wherein the nanosegregant has a thickness of 1-5 nm.

~~11.~~5. The coated substrate of claim 1, wherein the nanosegregant has a water contact angle of 0-25°.

~~12.~~6. The coated substrate of claim ~~11~~ 5, wherein the nanosegregant has a water contact angle of 5-20°.

~~13. The coated substrate of claim 1, wherein the nanosegregant has a capability to capture a water film having a thickness of 0.1-10 mm.~~

~~14.~~7. The coated substrate of claim ~~13~~ 1, wherein the nanosegregant captures a water film having a thickness of 0.5 – 3.0 mm.

~~15. The coated substrate of claim 7, wherein the nanosegregant has a thickness of 1-5 nm, a water contact angle of 5-20°, and the nanosegregant has a capability to capture a water film having a thickness of 0.5–3.0 mm.~~

~~16.~~8. The coated substrate of claim 1, wherein the nanosegregant has a thickness of 1-5 nm, a water contact angle of 5-20°, and the nanosegregant has a capability to capture a water film having a thickness of 0.5–3.0 mm.

~~17. A method of preparing a coated substrate, the method comprising:~~

~~providing an aqueous dispersion including a water soluble polymer and a water insoluble polymer;~~

~~applying the aqueous dispersion onto a surface of a substrate; and~~

~~allowing the applied aqueous dispersion to dry to form on the surface of the substrate a nanosegregant, due to different water affinity of the two polymers.~~

~~18. The method of claim 17, further comprising removing excess applied polymers to expose the nanosegregant.~~

~~19. The method of claim 17, wherein the water soluble polymer includes carboxylic groups or sulfonic groups.~~

~~20. The method of claim 17, wherein the water insoluble polymer includes aniline or thiophene groups.~~

~~21. The method of claim 20, wherein the water soluble polymer includes carboxylic groups or sulfonic groups.~~

~~22. The method of claim 21, wherein the water insoluble polymer is poly(3,4-ethelynedioxythiophene) ("PEDT") and the water soluble polymer is poly(styrene sulfonic acid) ("PSSH").~~

~~23. The method of claim 22, wherein the ratio between PEDT and PSSH is 1:2.5 to 1:20 by weight.~~

~~24. The method of claim 23, wherein the ratio between PEDT and PSSH is 1:6 by weight.~~

~~25. The method of claim 22, wherein the nanosegregant has a thickness of 1-5 nm, a water contact angle of 5-20°, and the nanosegregant has a capability to capture a water film having a thickness of 0.5–3.0 mm.~~

~~26. The method of claim 17, wherein the nanosegregant has a thickness of 1-5 nm, a water contact angle of 5-20°, and the nanosegregant has a capability to capture a water film having a thickness of 0.5-3.0 mm.~~

~~27.~~9. A solid-state supercapacitor comprising:

a positive electrode;

a negative electrode;

a nanosegregant formed from an aqueous dispersion including a water insoluble polymer and an ionizable water soluble polymer due to different water affinity of the two polymers, the nanosegregant having a thickness of 1-10 nm; and

a conductive film including the water insoluble polymer and the water soluble polymer, the film having a thickness of 0.4-500 μm,

wherein the nanosegregant is disposed between the positive electrode and the film, and the film is disposed between the negative electrode and the nanosegregant.

~~28.~~10. The solid-state supercapacitor of claim ~~27~~ 9, wherein the water soluble polymer includes carboxylic groups or sulfonic groups.

~~29.~~11. The solid-state supercapacitor of claim ~~27~~ 9, wherein the water insoluble polymer includes aniline groups or thiophene groups.

~~30.~~12. The solid-state supercapacitor of claim ~~29~~ 11, wherein the water soluble polymer includes carboxylic groups or sulfonic groups.

~~31.~~13. The solid-state supercapacitor of claim ~~30~~ 12, wherein the water insoluble polymer is poly(3,4-ethelynedioxythiophene) ("PEDT") and the water soluble polymer is poly(styrene sulfonic acid) ("PSSH").

~~32.~~14. The solid-state supercapacitor of claim ~~31~~ 13, wherein the ratio between PEDT and PSSH is 1:2.5 to 1:20 by weight.

~~33.~~15. The solid-state supercapacitor of claim ~~32~~ 14, wherein the ratio between PEDT and PSSH is 1:6 by weight.

~~34.~~16. The solid-state supercapacitor of claim ~~27~~ 9, wherein the nanosegregant has a thickness of 1-5 nm, the film has a thickness of 0.4-500 μm.

~~35.~~17. The solid-state supercapacitor of claim ~~31~~ 13, wherein the nanosegregant has a thickness of 1-5 nm, the film has a thickness of 0.4-500 μm.

~~36.~~18. The solid-state supercapacitor of claim ~~27~~ 9, wherein the aqueous dispersion further includes a carbon-based nanomaterial that has a high surface area and a high electric conductivity.

~~37.~~19. The solid-state supercapacitor of claim ~~31~~ 13, wherein the aqueous dispersion further includes a carbon-based nanomaterial that has a high surface area and a high electric conductivity.

~~38.~~20. The solid-state supercapacitor of claim ~~37~~ 19, wherein the carbon-based nanomaterial is graphene.