CLAIMS

1. A silicone hydrogel contact lens having a layered structural configuration and a water content gradient from inside to outside of the silicone hydrogel contact lens, comprising:

a silicone hydrogel core (or bulk material) completely covered with an outer (surface) hydrogel layer having a thickness of at least about 0.1 μm as measured with atomic force microscopy across a cross section from the posterior surface to the anterior surface of the silicone hydrogel contact lens in fully hydrated state,

wherein the outer hydrogel layer is substantially free of silicone, and

wherein the water content of the outer hydrogel layer is at least about 1.2 folds (or about 120%) of the water content (designated as WC_{SiHy}) of the silicone hydrogel bulk material when being fully hydrated.

2. The silicone hydrogel contact lens of claim **1**, wherein the outer hydrogel layer comprises two outer layers which merge at the peripheral edge of the silicone hydrogel contact lens, wherein the two outer layers are substantially identical to each other.

3. The silicone hydrogel contact lens of claim **2**, wherein the outer (surface) hydrogel layer has: a thickness of from about 0.1 μm to about 20 μm as measured with atomic force microscopy across a cross section from the posterior surface to the anterior surface of the silicone hydrogel contact lens in fully hydrated state; a surface silicon atomic percentage of about 5% or less of total elemental percentage as measured by XPS analysis of the silicone hydrogel contact lens in dried state; a water content that is at least about 1.3 folds (or about 130%) of the water content of the silicone hydrogel bulk material when being fully hydrated; a reduced surface modulus of at least about 20% relative to the silicone hydrogel bulk material when being fully hydrated; or a combination thereof.

4. The silicone hydrogel contact lens of claim **2**, wherein the outer (surface) hydrogel layer has: a thickness of from about 0.25 μm to about 15 μm as measured with atomic force microscopy across a cross section from the posterior surface to the anterior surface of the silicone hydrogel contact lens in fully hydrated state; a surface silicon atomic percentage of about 4% or less of total elemental percentage as measured by XPS analysis of the silicone hydrogel contact lens in dried state; a water content that is at least about 1.4 folds (or about 140%) of the water content of the silicone hydrogel bulk material when being fully hydrated; a reduced surface modulus of at least about 25% relative to the silicone hydrogel bulk material when being fully hydrated; or a combination thereof.

5. The silicone hydrogel contact lens of claim **2**, wherein the outer (surface) hydrogel layer has: a thickness of from about 0.5 μm to about 12.5 μm as measured with atomic force microscopy across a cross section from the posterior surface to the anterior surface of the silicone hydrogel contact lens in fully hydrated state; a surface silicon atomic percentage of about 3% or less of total elemental percentage as measured by XPS analysis of the silicone hydrogel contact lens in dried state; a water content that is at least about 1.5 folds (or about 150%) of the water content of the silicone hydrogel bulk material when being fully hydrated; a reduced surface modulus of at least about 30% relative to the silicone hydrogel bulk material when being fully hydrated; or a combination thereof.

6. The silicone hydrogel contact lens of claim **3**, wherein the outer (surface) hydrogel layer has: a thickness of from about 1 μm to about 10 μm as measured with atomic force microscopy across a cross section from the posterior surface to the anterior surface of the silicone hydrogel contact lens in fully hydrated state; a water content that is at least about 2 folds (or about 200%) of the water content of the silicone hydrogel bulk material when being fully hydrated; a reduced surface modulus of at least about 35% relative to the silicone hydrogel bulk material when being fully hydrated; or a combination thereof.

7. The silicone hydrogel contact lens of claim **4** , wherein the outer (surface) hydrogel layer has: a thickness of from about 1 μm to about 10 μm as measured with atomic force microscopy across a cross section from the posterior surface to the anterior surface of the silicone hydrogel contact lens in fully hydrated state; a water content that is at least about 2 folds (or about 200%) of the water content of the silicone hydrogel bulk material when being fully hydrated; a reduced surface modulus of at least about 40% relative to the silicone hydrogel bulk material when being fully hydrated; or a combination thereof.

8. The silicone hydrogel contact lens of claim **5**, wherein the outer (surface) hydrogel layer has: a thickness of from about 1 μm to about 10 μm as measured with atomic force microscopy across a cross section from the posterior surface to the anterior surface of the silicone hydrogel contact lens in fully hydrated state; a water content that is at least about 2 folds (or about 200%) of the water content of the silicone hydrogel bulk material when being fully hydrated; or a combination thereof.

9. The silicone hydrogel contact lens of claim **2**, wherein the water content of the outer hydrogel layer is at least about 2 folds (or about 200%) of the water content of the silicone hydrogel bulk material when being fully hydrated.

10. The silicone hydrogel contact lens of claim **3**, wherein the water content of the outer hydrogel layer is at least about 2 folds (or about 200%) of the water content of the silicone hydrogel bulk material when being fully hydrated.

11. The silicone hydrogel contact lens of claim **4**, wherein the water content of the outer hydrogel layer is at least about 2 folds (or about 200%) of the water content of the silicone hydrogel bulk material when being fully hydrated.

12. The silicone hydrogel contact lens of claim **5**, wherein the water content of the outer hydrogel layer is at least about 2 folds (or about 200%) of the water content of the silicone hydrogel bulk material when being fully hydrated.

13. The silicone hydrogel contact lens of claim **6**, wherein the water content of the outer hydrogel layer is at least about 2 folds (or about 200%) of the water content of the silicone hydrogel bulk material when being fully hydrated.

14. The silicone hydrogel contact lens of claim **2**, wherein the water content of the outer hydrogel layer is greater than 75% when being fully hydrated.

15. The silicone hydrogel contact lens of claim **2**, wherein when being fully hydrated the silicone hydrogel bulk material has: a water content (designated as WC_{siHy}) of from about 10% to about 70% by weight by weight; a bulk elastic modulus of from about 0.3 MPa to about 1.8 MPa; or a combination thereof.

16. The silicone hydrogel contact lens of claim **10**, wherein when being fully hydrated the silicone hydrogel bulk material has a water content (designated as WC_{siHy}) of from about 10% to about 60% by weight.

17. The silicone hydrogel contact lens of claim **11**, wherein when being fully hydrated the silicone hydrogel bulk material has: a water content (designated as WC_{siHy}) of from about 15% to about 55% by weight.

18. The silicone hydrogel contact lens of claim **12**, wherein when being fully hydrated the silicone hydrogel bulk material has: a water content (designated as WC_{siHy}) of from about 15% to about 50% by weight.

19. The silicone hydrogel contact lens of claim **2**, wherein the silicone hydrogel contact lens has at least one property selected from the group consisting of: (a) an oxygen transmissibility of at least about 40 barrers/mm when being fully hydrated; (b) a surface hydrophilicity characterized by having a water breakup time of at least about 10 seconds when being fully hydrated; (c) a surface wettability characterized by having an averaged water contact angle of about 90 degrees or less when being fully hydrated; (d) a surface lubricity characterized by having a critical coefficient of friction (designated as CCOF) of about **0.046** or less when being fully hydrated; and (e) combinations thereof.

20. The silicone hydrogel contact lens of claim **3**, wherein the silicone hydrogel contact lens has at least one property selected from the group consisting of: (a) an oxygen transmissibility of at least about 60 barrers/mm when being fully hydrated; (b) a surface hydrophilicity characterized by having a water breakup time of at least about 10 seconds when being fully hydrated; (c) a surface wettability characterized by having an averaged water contact angle of about 80 degrees or less when being fully hydrated; (d) a surface lubricity characterized by having a critical coefficient of friction (designated as CCOF) of about **0.043** or less when being fully hydrated; and (e) combinations thereof.

21. The silicone hydrogel contact lens of claim **4**, wherein the silicone hydrogel contact lens has at least one property selected from the group consisting of: (a) an oxygen transmissibility of at least about 80 barrers/mm when being fully hydrated; (b) a surface hydrophilicity characterized by having a water breakup time of at least about 10 seconds when being fully hydrated; (c) a surface wettability characterized by having an averaged water contact angle of about 80 degrees or less when being fully hydrated; (d) a surface lubricity characterized by having a critical coefficient of friction (designated as CCOF) of about **0.043** or less when being fully hydrated; and (e) combinations thereof.

22. The silicone hydrogel contact lens of claim **5**, wherein the silicone hydrogel contact lens has at least one property selected from the group consisting of: (a) an oxygen transmissibility of at least about 40 barrers/mm when being fully

hydrated; (b) a surface hydrophilicity characterized by having a water breakup time of at least about 10 seconds when being fully hydrated; (c) a surface wettability characterized by having an averaged water contact angle of about 80 degrees or less when being fully hydrated; (d) a surface lubricity characterized by having a critical coefficient of friction (designated as CCOF) of about 0.043 or less when being fully hydrated; and (e) combinations thereof.

23. The silicone hydrogel contact lens of claim **6**, wherein the silicone hydrogel contact lens has at least one property selected from the group consisting of: (a) an oxygen transmissibility of at least about 60 barrers/mm when being fully hydrated; (b) a surface hydrophilicity characterized by having a water breakup time of at least about 10 seconds when being fully hydrated; (c) a surface wettability characterized by having an averaged water contact angle of about 80 degrees or less when being fully hydrated; (d) a surface lubricity characterized by having a critical coefficient of friction (designated as CCOF) of about 0.043 or less when being fully hydrated; and (e) combinations thereof.

24. The silicone hydrogel contact lens of claim **2**, wherein the outer hydrogel layer has a water content that is higher than WC_{SiHy}, as characterized either (a) by having a water-swelling ratio (WSR) of at least about 100% if $WC_{SiHy} \leq 45\%$ or (b) by having a water-swelling ratio of at least about

$$\frac{120 \cdot WC_{SiHy}}{1 - WC_{SiHy}}\% \text{ if } WC_{SiHy} > 45\%.$$

25. The silicone hydrogel contact lens of claim **3**, wherein the outer hydrogel layer has a water content that is higher than WC_{SiHy}, as characterized either (a) by having a water-swelling ratio (WSR) of at least about 100% if $WC_{SiHy} \leq 45\%$ or (b) by having a water-swelling ratio of at least about

$$\frac{120 \cdot WC_{SiHy}}{1 - WC_{SiHy}}\% \text{ if } WC_{SiHy} > 45\%.$$

26. The silicone hydrogel contact lens of claim **4**, wherein the outer hydrogel layer has a water content that is higher than WC_{SiHy}, as characterized either (a) by having a water-swelling ratio (WSR) of at least about 150% if $WC_{SiHy} \leq 45\%$ or (b) by having a water-swelling ratio of at least about

$$\frac{130 \cdot WC_{SiHy}}{1 - WC_{SiHy}}\% \text{ if } WC_{SiHy} > 45\%.$$

27. The silicone hydrogel contact lens of claim **5**, wherein the outer hydrogel layer has a water content that is higher than WC_{SiHy}, as characterized either (a) by having a water-swelling ratio (WSR) of at least about 150% if $WC_{SiHy} \leq 45\%$ or (b) by having a water-swelling ratio of at least about

$$\frac{130 \cdot WC_{SiHy}}{1 - WC_{SiHy}}\% \text{ if } WC_{SiHy} > 45\%.$$

28. The silicone hydrogel contact lens of claim **15**, wherein the outer hydrogel layer has a water content that is higher than WC_{SiHy}, as characterized either (a) by having a water-swelling ratio (WSR) of at least about 150% if $WC_{SiHy} \leq 45\%$ or (b) by having a water-swelling ratio of at least about

$$\frac{130 \cdot WC_{SiHy}}{1 - WC_{SiHy}}\% \text{ if } WC_{SiHy} > 45\%.$$

29. The silicone hydrogel contact lens of claim **19**, wherein the outer hydrogel layer has a water content that is higher than WC_{SiHy}, as characterized either (a) by having a water-swelling ratio (WSR) of at least about 150% if $WC_{SiHy} \leq 45\%$ or (b) by having a water-swelling ratio of at least about

$$\frac{130 \cdot WC_{SiHy}}{1 - WC_{SiHy}}\% \text{ if } WC_{SiHy} > 45\%.$$

30. The silicone hydrogel contact lens of claim **22**, wherein the outer hydrogel layer has a water content that is higher than WC_{SiHy}, as characterized either (a) by having a water-swelling ratio (WSR) of at least about 150% if $WC_{SiHy} \leq 45\%$ or (b) by having a water-swelling ratio of at least about

$$\frac{130 \cdot WC_{SiHy}}{1 - WC_{SiHy}}\% \text{ if } WC_{SiHy} > 45\%.$$