CLAIMS

1. A biocompatible energization element comprising:

an anode spacer layer;

a first hole located in the anode spacer layer;

a cathode spacer layer;

at least a second hole, wherein the second hole is located in the cathode spacer layer, wherein the second hole is aligned to the first hole, and wherein the second hole is larger than the first hole such that when the first hole and the second hole are aligned there is a ridge of anode spacer layer exposed in the second hole;

a membrane layer, wherein the membrane layer is placed within the second hole and is adhered to the ridge of anode spacer layer;

a first cavity between sides of the first hole and a first surface of the membrane layer, wherein the first cavity is filled with an anode solution;

a second cavity between sides of the second hole and a second surface of the membrane layer, wherein the second cavity is filled with a cathode solution;

a third cavity wherein the third cavity is filled with a fuel solution and wherein a channel connects the third cavity to the first cavity; and

an electrically actuated channel blocking mechanism, wherein the channel blocking mechanism blocks the channel connecting the third cavity to the first cavity, and wherein the electrical actuation allows fuel to flow from the third cavity into the first cavity.

2. The biocompatible energization element according to claim 1, wherein the anode solution comprises a first enzyme.

3. The biocompatible energization element according to claim 2, wherein the anode solution comprises glucose-6-phosphate dehydrogenase.

4. The biocompatible energization element according to claim 2, wherein the anode solution comprises α-glucan phosphorylase.

5. The biocompatible energization element according to claim 2, wherein the anode solution comprises phosphoglucomutase.

6. The biocompatible energization element according to claim 2, wherein the anode solution comprises 6-phosphogluconate dehydrogenase.

7. The biocompatible energization element of claim 3, wherein the biocompatible energization element is electrically connected to an electroactive element within a biomedical device.

8. The biocompatible energization element of claim 1, wherein the biocompatible energization element is electrically connected to an electroactive element within a biomedical device.

9. The biocompatible energization element of claim 8, wherein the biomedical device is an ophthalmic device.

10. The biocompatible energization element of claim 9, wherein the ophthalmic device is a contact lens.

11. The biocompatible energization element according to claim 8, further comprising maltodextrin.

12. The biocompatible energization element according to claim 8, further comprising glucose.

13. The biocompatible energization element according to claim 1, additionally comprising a seal between the anode spacer layer and the cathode spacer layer, wherein
the seal also comprises any layers between the anode spacer layer and the cathode spacer layer.

14. The biocompatible energization element according to claim 13, wherein the seal is formed by laser welding.

15. The biocompatible energization element according to claim 13, wherein the seal is formed by ultrasonic welding.

16. The biocompatible energization element according to claim 13, wherein the seal is formed by photo-patterning of polymer seals.

17. The biocompatible energization element according to claim 1, further comprising a battery cell.

18. The biocompatible energization element according to claim 17, wherein the battery cell provides energy for the electrical actuation.