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8. The method of claim 1, wherein said organic substance is an ether or a ketone.

9. The method of claim 1, wherein said electrolyte solution further includes water.

10. The method of claim 1, wherein said electrolyte solution further includes a conductivity-enhancing agent.

11. The method of claim 10, wherein said conductivity-enhancing agent comprises an acid.

12. The method of claim 1, wherein said electrolyte solution further includes a base.

13. The method of claim 12, wherein said base includes a metal hydroxide.

14. The method of claim 13, wherein said metal hydroxide is an alkali or alkaline earth metal hydroxide.

15. The method of claim 12, wherein the concentration of said base in said electrolyte solution is at least 1 M.

16. The method of claim 12, wherein the concentration of said base in said electrolyte solution is at least 3 M.

17. The method of claim 12, wherein the concentration of said base in said electrolyte solution is at least 6 M.

18. The method of claim 12, wherein the concentration of said base in said electrolyte solution is at least 9 M.

19. The method of claim 12, wherein the concentration of said base in said electrolyte solution is at least 12 M.

20. The method of claim 12, wherein said electrolyte solution consists essentially of said organic substance and said base.

21. The method of claim 1, wherein said anode or said cathode includes carbon.

22. The method of claim 1, wherein said anode or said cathode includes nickel.

23. The method of claim 1, wherein said anode or said cathode includes platinum.

24. The method of claim 1, wherein said anode or said cathode includes a hydrogen storage alloy.

25. The method of claim 1, wherein the magnitude of said voltage is less than 1.0 V.

26. The method of claim 1, wherein the magnitude of said voltage is less than 0.5 V.

27. The method of claim 1, wherein the magnitude of said voltage is less than 0.25 V.

28. The method of claim 1, wherein said electrochemical cell is heated to a temperature above room temperature.

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