WHAT IS CLAIMED IS:

1. A method of actuating a well tool in a well, the method comprising:

a) releasing chemical energy from at least one portion of a reactive material;

b) thermally expanding a substance in response to the released chemical energy; and

c) applying pressure to a piston as a result of thermally expanding the substance, thereby actuating the well tool.

2. The method of claim 1, further comprising:

repeating steps a) - c) multiple times while the well tool is positioned downhole.

3. The method of claim 2, further comprising:

allowing the substance to cool between each repeated set of steps a) - c).

4. The method of claim 1, further comprising:

reducing pressure applied to the piston as a result of allowing the substance to cool.

5. The method of claim 3, further comprising:

displacing the piston as a result of allowing the substance to cool.

6. The method of claim 1, further comprising:

displacing the piston in a first direction as a result of the step of applying pressure to the piston; and

displacing the piston in a second direction opposite to the first direction as a result of allowing the substance to cool after the step of thermally expanding the substance.

7. The method of claim 1, further comprising:

compressing the substance due to hydrostatic pressure while conveying the well tool into the well.

8. The method of claim 1, further comprising:

compressing the substance with a spring.

9. The method of claim 1, further comprising:

restricting displacement of the piston with a latching device or friction producer.

10. The method of claim 1, further comprising:

compressing a formation fluid sample as a result of applying pressure to the piston.

11. The method of claim 1, wherein the thermally expanding further comprises changing a phase of the substance.

12. The method of claim 1, wherein releasing chemical energy further comprises oxidizing an aluminum component of the reactive material.

13. A method of actuating a well tool multiple times in a well, the method comprising:

for each of multiple actuations of the well tool while the well tool remains positioned in the well, performing the following set of steps:

a) releasing chemical energy from at least one portion of a reactive material;

b) thermally expanding a substance in response to the released chemical energy; and

c) applying pressure to a piston as a result of thermally expanding the substance, thereby actuating the well tool.

14. The method of claim 13, further comprising:

allowing the substance to cool between each successive set of steps a) - c).

15. The method of claim 13, further comprising:

reducing the pressure applied to the piston as a result of allowing the substance to cool.

16. The method of claim 13, further comprising:

displacing the piston as a result of allowing the substance to cool.

17. The method of claim 13, further comprising:

displacing the piston in a first direction as a result of each step of applying pressure to the piston; and

displacing the piston in a second direction opposite to the first direction as a result of allowing the substance to cool after each step of thermally expanding the substance.

18. The method of claim 13, further comprising:

compressing the substance due to hydrostatic pressure while conveying the well tool into the well.

19. The method of claim 13, further comprising:

compressing the substance prior to conveying the well tool into the well.

20. The method of claim 13, wherein the thermally expanding step further comprises changing a phase of the substance.

21. The method of claim 13, wherein releasing chemical energy further comprises oxidizing an aluminum component of the reactive material.

22. A well tool actuator, comprising:

a substance contained in a first chamber;

one or more portions of a reactive material from which chemical energy is released; and

a piston to which pressure is applied due to thermal expansion of the substance in response to release of chemical energy from the reactive material.

23. The well tool actuator of claim 22, wherein hydrostatic pressure in a well compresses the substance in the first chamber.

24. The well tool actuator of claim 22, wherein the piston displaces in response to the applied pressure.

25. The well tool actuator of claim 22, wherein chemical energy is released from multiple portions individually.

26. The well tool actuator of claim 22, wherein chemical energy released from the reactive material in a first one of the portions causes thermal expansion of the substance in the first chamber, and chemical energy released from the reactive material in a second one of the portions causes thermal expansion of the substance in a second chamber.

27. The well tool actuator of claim 26, wherein the piston displaces in a first direction in response to thermal expansion of the substance in the first chamber, and the piston displaces in a second direction opposite to the first direction in response to thermal expansion of the substance in the second chamber.

28. The well tool actuator of claim 26, further comprising a passage which equalizes pressure across the piston.

29. The well tool actuator of claim 22, wherein the substance comprises a material selected from the group including solids, liquids and gases.

30. The well tool actuator of claim 22, wherein the reactive material comprises aluminum and at least one of iron oxide and copper oxide.

31. A method of actuating a well tool multiple times in a well, the method comprising:

for each of multiple actuations of the well tool while the well tool remains positioned in the well, performing the following set of steps:

a) generating gas from at least one portion of a reactive material; and

b) applying pressure to a piston as a result of generating gas from the portion of the reactive material, thereby actuating the well tool.

32. The method of claim 31, further comprising:

allowing the gas to cool between each successive set of steps.

33. The method of claim 32, further comprising:

reducing the pressure applied to the piston as a result of allowing the gas to cool.

34. The method of claim 32, further comprising:

displacing the piston as a result of allowing the gas to cool.

35. The method of claim 32, further comprising:

displacing the piston in a first direction as a result of each step of applying pressure to the piston; and

displacing the piston in a second direction opposite to the first direction as a result of allowing the gas to cool.

36. A well tool actuator, comprising:

multiple portions of a reactive material which generates gas; and

a piston to which pressure is applied due to generation of gas by the reactive material.

37. The well tool actuator of claim 36, wherein the piston displaces in response to the applied pressure.

38. The well tool actuator of claim 36, wherein gas is generated from the multiple portions individually.

39. The well tool actuator of claim 36, wherein gas is generated from the multiple portions sequentially.

40. The well tool actuator of claim 36, wherein the piston displaces in a first direction in response to generation of gas from a first one of the portions of reactive material, and the piston displaces in a second direction opposite to the first direction in response to generation of gas from a second one of the portions of reactive material.

41. The well tool actuator of claim 36, further comprising a passage which equalizes pressure across the piston.

42. A fluid sampler comprising:

a chamber defined by a piston slidingly engaged in a well tool, wherein the chamber is configured to receive a fluid;

a valve disposed in communication with the chamber and configured to selectively allow the fluid to be received into the chamber; and

a reactive material disposed in communication with the piston and configured to pressurize the chamber upon activation.

43. The fluid sampler of claim 42 further comprising a metering device configured to limit a displacement speed of the piston.

44. The fluid sampler of claim 42 further comprising a latching mechanism to maintain pressure on the chamber.

45. The fluid sampler of claim 42 further comprising a plurality of reactive material portions disposed in communication with the piston and configured to pressure the chamber upon activation.

46. The fluid sampler of claim 45 further comprising a pressure sensor configured to monitor the pressure of formation fluid in the chamber and activate one or more portions of the reactive material to maintain the pressure of the fluid sample.

47. The fluid sampler of claim 45 wherein each of the plurality of reactive material portions are encapsulated.

48. A method comprising:

positioning a fluid sampler within a well, wherein the fluid sampler comprises:

a chamber defined by a piston slidingly engaged in a well tool;

a valve disposed in communication with the chamber and configured to selectively allow fluid communication between an exterior of the fluid sampler and the chamber; and

a reactive material disposed in communication with the piston and configured to pressurize the chamber upon activation;

obtaining a sample of fluid in the chamber;

releasing chemical energy from the reactive material to generate a pressure; and

transmitting the pressure to the sample through the piston.

49. The method of claim 48 further comprising limiting a displacement speed of the piston to maintain the sample in a representative state as received.

50. The method of claim 48 further comprising maintaining pressure on the chamber using a latching mechanism, a check valve, or both.

51. The method of claim 48, wherein the reactive material comprises a plurality of portions of reactive material, and wherein releasing chemical energy from the reactive material comprises selectively activating at least one of the portions of reactive material.

52. The method of claim 48 wherein releasing chemical energy from the reactive material comprises generating a gas from the reactive material.

53. The method of claim 48 wherein releasing chemical energy from the reactive material comprises oxidizing an aluminum component of the reactive material.

54. The method of claim 48 wherein the reactive material comprises aluminum and at least one substance selected from the group consisting of: iron oxide and copper oxide.

55. A method comprising:

positioning a fluid sampler within a well, wherein the fluid sampler comprises:

a chamber defined by a piston slidingly engaged in a well tool;

a valve disposed in communication with the chamber and configured to selectively allow fluid communication between an exterior of the fluid sampler and the chamber; and

a plurality of portions of a reactive material disposed in communication with the piston and configured to pressurize the chamber upon activation;

obtaining a sample of fluid in the chamber;

releasing chemical energy from at least one of the portions of the reactive material to generate a first pressure;

transmitting the first pressure to the sample through the piston;

releasing chemical energy from at least one additional portion of the reactive material to generate a second pressure; and

transmitting the second pressure to the sample through the piston.

56. The method of claim 55 wherein releasing chemical energy from at least one of the portions of the reactive material comprises generating a gas from the reactive material.

57. The method of claim 55 further comprising retrieving the fluid sampler from the well.

58. The method of claim 55 wherein the plurality of portions of the reactive material are isolated from each other.

59. The method of claim 55 at least one of the plurality of portions of the reactive material is encapsulated.

60. The method of claim 55 wherein the reactive material comprises an explosive, a propellant, a flammable solid, or any combination thereof.

61. The method of claim 55 wherein the reactive material comprises aluminum and at least one substance selected from the group consisting of: iron oxide and copper oxide.

CLAIMS

1. An invention not claimed in any divisional application.