CLAIMS

What is claimed is:

1. A method for forming a seal in a wellbore comprising:

providing an oilfield tubular and a swellable metal assembly in the wellbore, wherein the swellable metal assembly is located around or inside at least a portion of the oilfield tubular,

wherein the swellable metal assembly comprises a reactive metal and a polymer, wherein the polymer is in contact with at least a portion of the reactive metal;

urging, by the reactive metal, the polymer into contact with an inner wall of the wellbore or inside the oilfield tubular in response to the reactive metal reacting with a wellbore fluid,

wherein the reactive metal is configured to react with a wellbore fluid to form a metal hydroxide in-situ of the wellbore, and wherein the polymer has a phase change temperature such that the polymer is configured to phase change upon exposure to a heat of reaction of the reactive metal with the wellbore fluid and

wherein the phase change temperature of the polymer to transition from a solid polymer to a softened polymer or a liquid polymer is greater than a downhole temperature.

2. The method of claim 1, wherein the reactive metal is configured to react with a wellbore fluid to form a metal hydroxide in-situ of the wellbore, and wherein the polymer has a phase change temperature such that the polymer is configured to phase change upon exposure to a heat of reaction of the reactive metal with the wellbore fluid.

3. The method of claim 1, wherein the reactive metal is selected from magnesium, a magnesium alloy, calcium, a calcium alloy, aluminum, an aluminum alloy, or a combination thereof.

4. The method of claim 1, wherein the polymer comprises a thermoplastic polyurethane, a thermoplastic vulcanizate, or a combination thereof.

5. The method of claim 1, wherein the polymer comprises acrylic, ABS, nylon, PLA, polybenzimidazole, polycarbonate, polyether sulfone, polyoxymethylene, polyetherether ketone, polyetherimide, polyethylene, polyphenylene oxide, polyphenylene sulfide, polypropylene, polystyrene, polyvinyl chloride, polyvidnylidene fluoride, polytetrafluoroethylene, or a combination thereof.

6. The method of claim 1, wherein the polymer comprises an uncured elastomer.

7. The method of claim 1, wherein the reactive metal is an annular sleeve configured such that an inner surface of the reactive metal faces an outer surface of the oilfield tubular, and wherein the polymer i) is a polymer ring located in a groove of the annular sleeve, ii) is an endcap placed on an end of the annular sleeve, iii) is a polymer sleeve having holes formed therein, wherein the polymer sleeve is placed around the annular sleeve, or iv) is a tape applied to the annular sleeve.

8. The method of claim 1, further comprising:
contacting the reactive metal with a wellbore fluid.

9. A swellable metal assembly for an oilfield tubular, comprising:

a reactive metal configured for placement around or inside the oilfield tubular; and a polymer in contact with at least a portion of the reactive metal, wherein the polymer has a phase change temperature such that the polymer is configured to phase change upon exposure to a heat of reaction of the reactive metal with a wellbore fluid;

wherein the swellable metal assembly contacts an inner wall of the wellbore or inside the oilfield tubular in response to the reactive metal reacting with the wellbore fluid.

10. The swellable metal assembly of claim 9, wherein the reactive metal is configured to react with a wellbore fluid to form a metal hydroxide in-situ of a wellbore.

11. The swellable metal assembly of claim 10, wherein the phase change temperature of the polymer to transition from a solid polymer to a softened polymer or a liquid polymer is greater than a downhole temperature.

12. The swellable metal assembly of claim 9, wherein the reactive metal is selected from magnesium, a magnesium alloy, calcium, a calcium alloy, aluminum, an aluminum alloy, or a combination thereof.

13. The swellable metal assembly of claim 9, wherein the polymer comprises a thermoplastic polyurethane, a thermoplastic vulcanizate, or a combination thereof.

14. The swellable metal assembly of claim 9, wherein the polymer comprises acrylic, ABS, nylon, PLA, polybenzimidazole, polycarbonate, polyether sulfone, polyoxymethylene, polyetherether ketone, polyetherimide, polyethylene, polyphenylene oxide, polyphenylene sulfide, polypropylene, polystyrene, polyvinyl chloride, polyvidnylidene fluoride, polytetrafluoroethylene, or a combination thereof.

15. The swellable metal assembly of claim 9, wherein the polymer comprises an uncured elastomer.

16. The swellable metal assembly of claim 9, wherein the reactive metal is an annular sleeve configured such that an inner surface of the reactive metal faces an outer surface of the oilfield tubular, and wherein the polymer i) is a polymer ring located in a groove of the annular sleeve, ii) is an endcap placed on an end of the annular sleeve, iii) is a polymer sleeve having holes formed therein, wherein the polymer sleeve is placed around the annular sleeve, or iv) is a tape applied to the annular sleeve.

17. The swellable metal assembly of claim 9, wherein the reactive metal is a cylindrical or spherical solid body having an outer diameter that is less than an inner diameter of the oilfield tubular.

18. A swellable metal system for use in a wellbore, comprising:

an oilfield tubular; and

a swellable metal assembly placed around or inside the oilfield tubular in a first configuration,

wherein the swellable metal assembly is configured to contact an inner wall of a wellbore or inside the oilfield tubular in a second configuration;

wherein the swellable metal assembly comprises:

a reactive metal, and

a polymer in contact with at least a portion of the reactive metal; and

wherein the reactive metal is configured to react with a wellbore fluid to form a metal hydroxide in-situ of the wellbore, and wherein the polymer has a phase change temperature such that the polymer is configured to phase change upon exposure to a heat of reaction of the reactive metal with the wellbore fluid.

19. The method of claim 1, wherein the inner wall of the wellbore is an inner surface of a casing or a formation.