

CLAIMS

We claim:

1. A swellable packer assembly for positioning in a wellbore, the swellable packer assembly comprising:

a mandrel;

a sealing element disposed about at least a portion of the mandrel, the sealing element formed of a material responsive to exposure to a fluid in a wellbore to radially expand from the mandrel; and

a degradable metal coating disposed about at least a portion of an outer surface of the sealing element, the degradable metal coating fluidly isolating the portion of an outer surface of the sealing element from a fluid external to an exterior surface of the coating;

wherein the degradable metal coating is selectively removable from the mandrel downhole so as to expose the sealing element to the fluid in the wellbore.

2. The swellable packer assembly according to claim 1, wherein the degradable metal coating is a metal alloy comprising at least one selected from the group consisting of magnesium, aluminum, and calcium.

3. The swellable packer assembly according to claim 1, wherein the degradable metal coating comprises a doped magnesium alloy comprising from about 0.5% to 5% dopant.

4. The swellable packer assembly according to claim 1, wherein the degradable metal coating comprises a doped magnesium alloy selected from the group consisting of:

a doped WE magnesium alloy comprising 86.6% to 90.6% magnesium, about 4% rare earth metal yttrium, about 4% rare earth metal that is not yttrium, 1% to about 5% dopant from the group consisting of iron, nickel, copper, and any combination thereof, and selected about 0.4% supplemental material of zirconium, each by weight of the doped WE magnesium alloy;

a doped AZ magnesium alloy comprising about 88.5% magnesium, about 9% aluminum, about 0.7% zinc, 1% to about 5% dopant selected from the group consisting of

iron, nickel, copper, and any combination thereof, about 0.2% supplemental material of manganese, and about 0.3% supplemental material of zinc, each by weight of the doped AZ magnesium alloy;

a doped AZ magnesium alloy comprises about 94.5% magnesium, about 3% aluminum, about 1% zinc, 1% to about 5% dopant selected from the group consisting of iron, nickel, copper and any combination thereof, and about 0.3% supplemental material of manganese, each by weight of the doped AZ magnesium alloy;

a doped ZK magnesium alloy comprising about 91.7% magnesium, about 5.9% zinc, about 0.2% zirconium, and about 2% dopant selected from the group consisting of copper, nickel, iron, and any combination thereof, each by weight of the doped ZK magnesium alloy;

a doped ZK magnesium alloy comprising about 89.9% magnesium, about 3.2% zinc, about 0.6% zirconium, and about 6.3% dopant selected from the group consisting of copper, nickel, iron, and any combination thereof, each by weight of the doped ZK magnesium alloy; and

a doped AM magnesium alloy comprising about 91.4% magnesium, about 6% aluminum, about 0.2% manganese, about 2% dopant selected from the group consisting of copper, nickel, iron, and any combination thereof, about 0.2% supplemental material of silicon, and about 0.2% supplemental material of zinc, each by weight of the doped AM magnesium alloy.

5. The swellable packer assembly according to claim 4, wherein the rare earth metal in the doped WE magnesium alloy that is not yttrium is selected from the group consisting of scandium, lanthanum, cerium, praseodymium, neodymium, promethium, samarium, europium, gadolinium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium, and any combination thereof.

6. The swellable packer assembly according to claim 1, wherein the degradable metal coating exhibits a tensile strength of from about 5,000 psi to about 35,000 psi.

7. The swellable packer assembly according to claim 1, wherein the degradable metal coating exhibits a thickness of from about 20 thousandths of an inch to about a quarter inch.

8. The swellable packer assembly according to claim 1, wherein the degradable metal coating does not require a retaining element in order to be disposed at least a portion of an outer surface of the sealing element.
9. The swellable packer assembly according to claim 1, wherein the degradable metal coating is formed by one of spray deposition, electronic deposition, shrink wrapping, adhesive tape, and adhesive wrap.
10. The swellable packer assembly according to claim 1, wherein the degradable metal coating coupled to at least a portion of the outer surface of the sealing element by chemical bonding or by an adhesive.
11. A method of using a swellable packer assembly, the method comprising:
 - running a swellable packer assembly into a wellbore on a conveyance so as to position the swellable packer assembly at a predetermined downhole location, wherein the sealing element of the swellable packer assembly is in an inactivated configuration;
 - selectively removing a degradable metal coating disposed about at least a portion of an outer surface of the sealing element; and
 - causing the sealing element to be exposed to a wellbore fluid thereby activating the sealing element to induce swelling of the sealing element.
12. The method according to claim 11, wherein selectively removing a degradable metal coating comprises causing the degradable metal coating to be exposed to a wellbore fluid.
13. The method according to claim 11, wherein selectively removing a degradable metal coating comprises exposing the degradable metal coating to a trigger fluid circulated from the surface or released by a downhole tool.
14. The method according to claim 11, wherein selectively removing a degradable metal coating comprises applying a voltage to the degradable metal coating.
15. The method according to claim 11, further comprising selectively removing the degradable metal coating after a predetermined period of time.
16. A downhole swellable packer system comprising:

a conveyance;

a mandrel coupled with the conveyance;

a sealing element disposed about at least a portion of the mandrel, the sealing element formed of a material responsive to exposure to a trigger fluid in a wellbore to radially expand from the mandrel; and

a degradable metal coating disposed about at least a portion of an outer surface of the sealing element, the degradable metal coating fluidly isolating the portion of an outer surface of the sealing element from an exterior of the coating;

wherein the degradable metal coating is selectively removable from the mandrel downhole so as to expose the sealing element to the trigger fluid in the wellbore.

17. The system according to claim 16, further comprising a triggering fluid disposed within the wellbore, the triggering fluid configured to cause the degradable metal coating to degrade.

18. The system according to claim 16, wherein the degradable metal coating is a metal alloy comprising at least one selected from the group consisting of magnesium, aluminum, and calcium.

19. The system according to claim 16, wherein the degradable metal coating comprises a doped magnesium alloy comprising from about 0.5% to 5% dopant.

20. The system according to claim 16, wherein the degradable metal coating comprises a doped magnesium alloy selected from the group consisting of:

a doped WE magnesium alloy comprising 86.6% to 90.6% magnesium, about 4% rare earth metal yttrium, about 4% rare earth metal that is not yttrium, 1% to about 5% dopant from the group consisting of iron, nickel, copper, and any combination thereof, and selected about 0.4% supplemental material of zirconium, each by weight of the doped WE magnesium alloy;

a doped AZ magnesium alloy comprising about 88.5% magnesium, about 9% aluminum, about 0.7% zinc, 1% to about 5% dopant selected from the group consisting of

iron, nickel, copper, and any combination thereof, about 0.2% supplemental material of manganese, and about 0.3% supplemental material of zinc, each by weight of the doped AZ magnesium alloy;

a doped AZ magnesium alloy comprises about 94.5% magnesium, about 3% aluminum, about 1% zinc, 1% to about 5% dopant selected from the group consisting of iron, nickel, copper and any combination thereof, and about 0.3% supplemental material of manganese, each by weight of the doped AZ magnesium alloy;

a doped ZK magnesium alloy comprising about 91.7% magnesium, about 5.9% zinc, about 0.2% zirconium, and about 2% dopant selected from the group consisting of copper, nickel, iron, and any combination thereof, each by weight of the doped ZK magnesium alloy;

a doped ZK magnesium alloy comprising about 89.9% magnesium, about 3.2% zinc, about 0.6% zirconium, and about 6.3% dopant selected from the group consisting of copper, nickel, iron, and any combination thereof, each by weight of the doped ZK magnesium alloy; and

a doped AM magnesium alloy comprising about 91.4% magnesium, about 6% aluminum, about 0.2% manganese, about 2% dopant selected from the group consisting of copper, nickel, iron, and any combination thereof, about 0.2% supplemental material of silicon, and about 0.2% supplemental material of zinc, each by weight of the doped AM magnesium alloy.