

What is claimed is:

1. A microencapsulated biocide comprising:
a core material comprising an isothiazolone biocide or antifouling agent encapsulated in a wall material; and
wherein the wall material is a dual wall, and the dual wall has an inner wall containing an acrylic polymer or a melamine-formaldehyde resin encapsulated by the outer wall, which contains a reaction product of polyvinyl alcohol, urea, resorcinol, and glutaraldehyde, or the dual wall has an inner wall containing gelatin-gum arabic and an outer wall containing melamine formaldehyde, or the wall material is a multi-wall and the multi-wall includes a reaction product of an aromatic polyisocyanate as the first wall, a gelatin-gum arabic as the second wall, and a melamine-formaldehyde as the overcoat wall;
wherein the capsule releases 10% or less of the isothiazolone biocide or antifouling agent in xylene at room temperature over 90 days and provides sustained release of the core material upon immersion in water.
2. The microencapsulated biocide of claim 1 wherein the isothiazolone includes 4,5-dichloro-2-n-octyl-3(2H)-isothiazolone.
3. The microencapsulated biocide of claim 1 wherein the water leaches the core material from the capsule.
4. The microencapsulated biocide of claim 1 wherein the core material further comprises a partially water soluble solvent that dissolves the isothiazolone biocide or antifouling agent.
5. The microencapsulated biocide of claim 4 wherein the partially water soluble solvent has a boiling point above 175°C.

6. The microencapsulated biocide of claim 1 included in a coating composition comprising a film former or binder.
7. The microencapsulated biocide of claim 6 wherein the coating composition is a marine paint.
8. The microencapsulated biocide of claim 1 included in a roofing material.
9. The microencapsulated biocide of claim 1 wherein the core material further comprises a partially water soluble solvent having a partial water solubility of 0.5 % to 5 % in water.
10. The microencapsulated biocide of claim 9 wherein the partially water soluble solvent dissolves in water in an amount of 0.5% to 5% and is incorporated into the core in an amount of 5% to 25%.
11. The microencapsulated biocide of claim 9 wherein the solvent is selected from the group consisting of dimethyl adipate, diisobutyl adipate, diisobutyl glutarate, diisobutyl succinate, polyglycol, glycol ether EB acetate, and mixtures thereof.
12. The microencapsulated biocide of claim 9 wherein the isothiazolone includes 4,5-dichloro-2-n-octyl-3(2H)-isothiazolone.
13. A coating composition comprising:
 - a film former or binder; and
 - a microencapsulated biocide comprising:
 - a core material comprising an isothiazolone biocide or antifouling agent;
 - and

one or more layers of wall material encapsulating the core material to form a capsule;

wherein the capsule is stable in xylene and is permeable to water for water to leach the core material from the capsule as a sustained release;

wherein the capsule releases about 10% or less of the isothiazolone biocide or antifouling agent in xylene at room temperature over 90 days and provides sustained release of the core material upon immersion in water;

wherein the wall material is a dual wall, and the dual wall has an inner wall containing an acrylic polymer or a melamine-formaldehyde resin encapsulated by the outer wall, which contains a reaction product of polyvinyl alcohol, urea, resorcinol, and glutaraldehyde, or the dual wall has an inner wall containing gelatin-gum arabic and an outer wall containing melamine formaldehyde, or the wall material is a multi-wall and the multi-wall includes a reaction product of an aromatic polyisocyanate as the first wall, a gelatin-gum arabic as the second wall, and a melamine-formaldehyde as the overcoat wall.

14. A roofing material including a microencapsulated biocide comprising:

a core material comprising an isothiazolone biocide or antifouling agent; and

wherein the wall material is a dual wall, and the dual wall has an inner wall containing an acrylic polymer or a melamine-formaldehyde resin encapsulated by the outer wall, which contains a reaction product of polyvinyl alcohol, urea, resorcinol, and glutaraldehyde, or the dual wall has an inner wall containing gelatin-gum arabic and an outer wall containing melamine formaldehyde, or the wall material is a multi-wall and the multi-wall includes a reaction product of an aromatic polyisocyanate as the first wall, a gelatin-gum arabic as the second wall, and a melamine-formaldehyde as the overcoat wall;

wherein the capsule is stable in xylene and is permeable to water for water to leach the core material from the capsule as a sustained release;

wherein the capsule releases 10% or less of the isothiazolone biocide or antifouling agent in xylene at room temperature over 90 days.

What is claimed is:

1. A microencapsulated biocide comprising:
a core material comprising an isothiazolone biocide or antifouling agent encapsulated in a wall material; and
wherein the wall material is a dual wall comprising:
a first interfacial capsule wall of acrylic polymer and a second wall of polyvinyl alcohol-urea-resorcinol-glutaraldehyde, or
an inner wall of melamine-formaldehyde resin re-encapsulated with polyvinyl alcohol-urea-resorcinol-glutaraldehyde, or
an inner wall containing gelatin-gum arabic and an outer wall containing melamine-formaldehyde resin, or
the wall material is a multi-wall comprising
an interfacial reaction product of an aromatic polyisocyanate as the first wall, a gelatin-gum arabic as the second wall, and a melamine-formaldehyde resin as an overcoat wall;
wherein the capsule releases 10% or less of the isothiazolone biocide or antifouling agent in xylene at room temperature over 90 days and provides sustained release of the core material upon immersion in water.
2. The microencapsulated biocide of claim 1 wherein the isothiazolone includes 4,5-dichloro-2-n-octyl-3(2H)-isothiazolone.
3. The microencapsulated biocide of claim 1 wherein the water leaches the core material from the capsule.
4. The microencapsulated biocide of claim 1 wherein the core material further comprises a partially water soluble solvent that dissolves the isothiazolone biocide or antifouling agent, the partially water soluble solvent having a solubility of 0.5 % to 5 % in water.

5. The microencapsulated biocide of claim 4 wherein the partially water soluble solvent has a boiling point above 175°C.
6. The microencapsulated biocide of claim 1 included in a marine paint.
7. The microencapsulated biocide of claim 6 wherein the coating composition is a marine paint.
8. The microencapsulated biocide of claim 1 included in a roofing material.
9. The microencapsulated biocide of claim 1 wherein the core material further comprises a partially water soluble solvent having a partial water solubility of 0.5 % to 5 % in water.
10. The microencapsulated biocide of claim 9 wherein the partially water soluble solvent dissolves in water in an amount of 0.5% to 5% and is incorporated into the core in an amount of 5% to 25%.
11. The microencapsulated biocide of claim 9 wherein the solvent is selected from the group consisting of dimethyl adipate, diisobutyl adipate, diisobutyl glutarate, diisobutyl succinate, polyglycol, glycol ether EB acetate, and mixtures thereof.
12. The microencapsulated biocide of claim 9 wherein the isothiazolone includes 4,5-dichloro-2-n-octyl-3(2H)-isothiazolone.
13. A coating composition comprising:
 - a film former or binder; and
 - a microencapsulated biocide comprising:
 - a core material comprising an isothiazolone biocide or antifouling agent; and
 - one or more layers of wall material encapsulating the core material to form a capsule;

wherein the capsule is stable in xylene and is permeable to water for water to leach the core material from the capsule as a sustained release;

wherein the capsule releases 10% or less of the isothiazolone biocide or antifouling agent in xylene at room temperature over 90 days and provides sustained release of the core material upon immersion in water;

wherein the wall material is a dual wall, and the dual wall has an inner wall containing an acrylic polymer or a melamine-formaldehyde resin encapsulated by the outer wall, which contains a reaction product of polyvinyl alcohol, urea, resorcinol, and glutaraldehyde, or the dual wall has an inner wall containing gelatin-gum arabic and an outer wall containing melamine formaldehyde, or the wall material is a multi-wall and the multi-wall includes a reaction product of an aromatic polyisocyanate as the first wall, a gelatin-gum arabic as the second wall, and a melamine-formaldehyde as the overcoat wall.

14. A roofing material including a microencapsulated biocide comprising:

a core material comprising an isothiazolone biocide or antifouling agent; and

wherein the wall material is a dual wall, and the dual wall has an inner wall containing an acrylic polymer or a melamine-formaldehyde resin encapsulated by the outer wall, which contains a reaction product of polyvinyl alcohol, urea, resorcinol, and glutaraldehyde, or the dual wall has an inner wall containing gelatin-gum arabic and an outer wall containing melamine formaldehyde, or the wall material is a multi-wall and the multi-wall includes a reaction product of an aromatic polyisocyanate as the first wall, a gelatin-gum arabic as the second wall, and a melamine-formaldehyde as the overcoat wall;

wherein the capsule is stable in xylene and is permeable to water for water to leach the core material from the capsule as a sustained release;

wherein the capsule releases 10% or less of the isothiazolone biocide or antifouling agent in xylene at room temperature over 90 days.