

Claims

1. A core-shell composite comprising:
a core comprising zinc metal; and
5 a shell that at least partially encapsulates said core, said shell comprising a salt of said zinc metal as a cation with a sulphur-containing anion.
2. The core-shell composite of claim 1, wherein said sulphur-containing anion has the formula $[S_xO_{1-x}]^{y-}$, where $0 < x \leq 1$ and y is 1 or 2.
- 10 3. The core-shell composite of claim 1 or 2, wherein said shell comprises a plurality of layers, each layer independently comprising said salt of said zinc metal as a cation with a sulphur-containing anion.
4. A method of forming a core-shell composite comprising the step of heating a mixture of a zinc
15 metal particle with elemental sulphur to form said core-shell composite,
wherein the zinc metal particle forms the core of said core-shell composite,
and wherein the shell of said core-shell composite at least partially encapsulates said core and
comprises a salt of said zinc metal as a cation with a sulphur-containing anion.
- 20 5. The method of claim 4, further comprising the step of reacting said core-shell composite with an aqueous solution.
6. The method of claim 4 or 5, wherein said heating step is undertaken at a temperature in the range of
25 100 °C to 160 °C.
7. The method of any one of claims 4 to 6, wherein said heating step is undertaken for a period of time
in the range of 1 hour to 10 hours.
8. The method of claim 4, further comprising the step of, before said reacting step, cooling the core-
30 shell composite to a temperature of 100 °C.
9. The method of claim 5, wherein said reacting step is undertaken at a temperature in the range of 90
°C to 110 °C.
- 35 10. The method of claim 5 or 9, wherein said reacting step is undertaken for a period of time in the
range of 1 hour to 10 hours.
11. The method of any one of claims 5, 9 or 10, wherein said aqueous solution is water.
- 40 12. A method of killing or inhibiting the growth of a microbe, comprising the step of subjecting said
microbe to a core-shell composite, wherein said core-shell composite comprises:
a core comprising zinc metal; and
a shell that at least partially encapsulates said core, said shell comprising a salt of said zinc metal as a
45 cation with a sulphur-containing anion.
13. The method of claim 12, wherein said core-shell composite is present as a coating on a substrate
surface.
14. The method of claim 12, wherein said core-shell composite is present as an additive in a
50 composition or a formulation.
15. The method of claim 14, wherein said composition or formulation is non-therapeutic.

16. Use of a core-shell composite as an anti-microbial coating on a substrate surface, wherein said core-shell composite comprises:
a core comprising zinc metal; and
a shell that at least partially encapsulates said core, said shell comprising a salt of said zinc metal as a cation with a sulphur-containing anion.
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17. Use of a core-shell composite as an additive in a composition or a formulation, wherein said core-shell composite comprises:
a core comprising zinc metal; and
a shell that at least partially encapsulates said core, said shell comprising a salt of said zinc metal as a cation with a sulphur-containing anion.
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