

CLAIMS

What is claimed:

1. An agrochemical formulation, comprising:
at least one agrochemical active ingredient, and
5 a sulfopolymer that has not been lyophilized.
2. The agrochemical formulation of claim 1, which is an agrochemical concentrate formulation comprising the at least one agrochemical active ingredient at a level at least twice as high as its as-applied level.
3. An agrochemical concentrate formulation, comprising:
10 at least one agrochemical active ingredient, and
a sulfopolymer that has not been lyophilized.
4. An agrochemical concentrate formulation comprising:
5wt% to 90wt% agrochemical active ingredient or a mixture of two or more agrochemical active ingredients, and
15 up to 15wt% of a sulfopolymer that has not been lyophilized,
relative to the total weight of the formulation.
5. An agrochemical concentrate formulation comprising:
at least one agrochemical active ingredient; and
no more than 15wt% sulfopolymer that has not been lyophilized;
20 which formulation is characterized by one or more of:
dispersibility and/or reliable re-dispersibility of the active ingredient(s);
high active ingredient loading capacity; and/or
increased stability of the formulation.
6. An as-applied agrochemical composition comprising the formulation of any one of
25 claims 1-5, diluted in water.
7. The as-applied agrochemical composition of claim 6, wherein the water has a total water hardness of from 0 to 1500 ppm.
8. The as-applied agrochemical composition of any one of claims 6-7, comprising: at least 0.001wt% concentrate formulation, relative to the total weight of the
30 composition.

9. The as-applied agrochemical composition of any one of claims 6-8, applied to a surface of a plant leaf, stem, stalk, branch, flower, fruit, or root, or to growing medium.
10. Use of a sulfopolymer that has not been lyophilized to stabilize an agriculturally active agent in a formulation.
11. Use of a sulfopolymer that has not been lyophilized to homogenously disperse an agriculturally active agent in a formulation.
12. Use of a sulfopolymer that has not been lyophilized as a surfactant adjuvant in an agrochemical formulation comprising an agriculturally active ingredient.
13. Use of the formulation or composition of any of claims 1-12 in the preparation of an as-applied agrochemical composition for application to a plant, a plant part, or a growing medium.
14. The use of claim 13, comprising diluting a volume of the formulation in at least an equal volume of water.
15. An as-applied agrochemical formulation comprising:
at least one agrochemical active ingredient, and;
a sulfopolymer that has not been lyophilized.
16. The as-applied agrochemical formulation of claim 15, which is readily redispersible after settling.
17. An as-applied agrochemical formulation comprising:
at least one agrochemical active ingredient, and;
a sulfopolymer that has not been lyophilized.
18. An as-applied agrochemical formulation comprising:
0.05wt% to 20wt% agrochemical active ingredient or a mixture of two or more agrochemical active ingredients, and
up to 5wt% of a sulfopolymer that has not been lyophilized,
relative to the total weight of the formulation.
19. An as-applied agrochemical formulation comprising:
at least one insoluble or partially soluble agrochemical active ingredient; and
no more than 15wt% sulfopolymer that has not been lyophilized;
which formulation is characterized by one or more of:
dispersibility and/or reliable re-dispersibility of the active ingredient(s);

high active ingredient loading capacity; and/or
increased stability of the formulation.

20. The as-applied formulation of any one of claims 6-9 or 15-19, characterized in comparison to a control as-applied agrochemical formulation not containing the sulfopolymer.

21. The formulation of claim 20, wherein the control as-applied agrochemical formulation is one of: a formulation containing the same components but omitting the sulfopolymer, or a formulation containing the same components but with the sulfopolymer replaced with an industry standard emulsifier.

22. The formulation, composition, method or use of any one of claims 6-9 or 15-21, comprising a minimum of 0.0005wt% active ingredient.

23. Use of the as-applied agrochemical composition of any one of claims 7-9 or the formulation of any one of claims 15-22 to treat a plant or a growth medium for an agricultural purpose.

24. The use of claim 23, wherein the agricultural purpose comprises one or more of: increasing nutrient availability, increasing nutrient uptake, increasing plant growth, decreasing plant growth, increasing seed or fruit set or maturation, inhibiting insect growth or reproduction, inhibiting nematocyte growth or reproduction, inhibiting fungal growth or reproduction, inhibiting mollusc growth or reproduction, killing or repelling insects, killing or repelling nematodes, or killing or repelling molluscs.

25. The formulation, composition, method or use of any one of claims 1-24, wherein the active ingredient comprises one or more of a fertilizer, a hormone or other plant growth regulator, an insecticide, a larvicide, a miticide, an herbicide, a fungicide, a nematocide, a molluscicide, a miticide, a larvicide, a fertilizer, and/or a hormone or other growth regulator.

26. A method comprising: combining a sulfopolymer that has not been lyophilized and at least one agrochemical active ingredient with water to produce a mixture.

27. The method of claim 26, wherein the sulfopolymer is added to the mixture as a homogeneous aqueous dispersion.

28. The method of claim 27, wherein the homogenous sulfopolymer dispersion comprises: at least 0.5wt% sulfopolymer in water, relative to the total weight of the dispersion.

29. The formulation, composition, method, or use of any one of claims 1-28, wherein the sulfopolymer comprises a salt of a sulfoisophthalic moiety.
30. The formulation, composition, method, or use of any one of claims 1-29, wherein the sulfopolymer comprises a sulfopolyester, a sulfopolyamide, or a sulfopolyesteramide.
31. The formulation, composition, method or use of any one of claims 1-30, wherein the sulfopolymer comprises 5-sodiosulfonate isophthalic acid (5-SSIPa).
32. The formulation, composition, method or use of any one of claims 1-30, wherein the sulfopolymer is a sulfopolyester.
33. The formulation, composition, method or use of claim 32, wherein the sulfopolyester has an average molecular weight (MW) of at least 5 kDa.
34. The formulation, composition, method, or use of any one of claims 1-33, comprising: no more than 14wt% sulfopolyester, relative to the total weight of the formulation or composition.
35. The method of any one of claim 26-34, wherein the water is provided to the mixture at: at least 50°C.
36. The method of any one of claims 26-35, further comprising adding at least one additional agriculturally acceptable ingredient.
37. The method of claim 36, wherein the at least one additional agriculturally acceptable ingredient comprises one or more of: an anti-foaming agent, a dispersal agent, a solubilizer, a viscosity reducing agent, an anti-freeze agent, a sticker, a spreader, a drift control adjuvant, a stabilizing agent, a preservative, an odorant, a colorant, a sequestrant, a chelator, an antioxidant, a buffer or other pH regulator, a solvent, an oil, or a polymer other than the sulfopolymer.
38. The formulation, composition, method or use of any one of the prior claims, wherein the stability of the formulation, composition, or mixture comprises one or more of: stability at above 30°C for at least two weeks.
39. The formulation, composition, method or use of any one of claims 1-38, wherein the sulfopolymer comprises recovered sulfopolyester.
40. The formulation, composition, method or use of any one of claims 1-39, wherein the formulation, composition, or mixture further comprises a rosin.

41. The formulation, composition, method or use of claim 40, wherein the rosin is present at 0.1wt% to 10wt%.
42. The formulation, composition, method or use of any one of claims 40-41, wherein the rosin comprises a rosin ester.
- 5 43. The formulation, composition, method or use of any one of claims 40-42, wherein the rosin comprises a methyl ester of rosin, a glycerol ester of rosin, a triethylene glycol ester of a rosin, or a pentaerythritol ester of rosin, optionally any of said rosins being hydrogenated before or after esterification.
- 10 44. The method of any one of claims 26-43, wherein the mixture is formulated as a suspension, a solvent dispersion, or an emulsion.
45. The method of claim 44, wherein the emulsion is a solvent-in-water emulsion, a water-in-solvent emulsion, an oil-in-water emulsion, or a water-in-oil emulsion.
46. The formulation, composition, method or use of any one of claims 1-45, wherein the sulfopolymer has a charge density of at least 0.5meq/g.
- 15 47. The formulation, composition, method or use of any one of claims 1-46, wherein the formulation or composition exhibits a percent spontaneity of dispersion of at least 80%.
48. The formulation, composition, method or use of any one of claims 1-47, wherein the formulation or composition does not comprise a safener.
- 20 49. The formulation, composition, method or use of any one of claims 1-48, wherein the formulation or composition exhibits a contact angle that is at least 76°, wherein the contact angle is measured according to the procedure disclosed in the specification at a dilution of from 1:10 to 1:100.