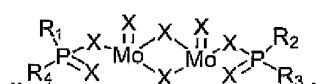
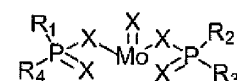


What is claimed is:

1. A method of inhibiting deposition of a foulant comprising:
introducing into a process equipment or a fluid in contact with the process equipment
a composition comprising a molybdenum-containing complex comprising:
at least one molybdenum-containing complex having the formula selected
from Formula I, II, III, or IV.

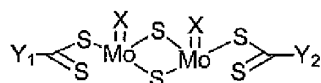


Formula I

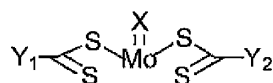


Formula II

wherein R₁, R₂, R₃, and R₄, are each a hydrocarbon group and wherein R₁, R₂, R₃, and R₄ can be the same or different; and X is oxygen or sulfur and X can be the same or different.



Formula III



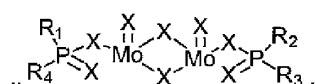
Formula IV

wherein Y₁ and Y₂ are each oxygen, nitrogen or carbon-containing ligands and Y¹ and Y² can be the same or different, and X is each oxygen or sulfur, and X can be the same of different from each other.

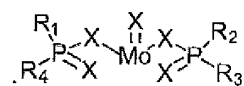
2. The method of claim 1, wherein the introducing is by injecting, spraying, or dripping the molybdenum-containing complex.
3. The method as in any one of claims 1-2, wherein the introducing is carried out after or during a decoking or cleaning or during a warm up process.
4. The method as in any one of claims 1-3, wherein the introducing is carried out during a hydrocarbon processing.
5. The method as in any one of claims 1-4, wherein the introducing is carried out intermittently.

6. The method as in any one of claims 1-4, wherein the introducing is carried out continuously.
7. The method as in any one of claims 1-6, wherein the process equipment comprises coils, heat exchangers, transfer line exchangers quench coolers, furnaces, separation columns or fractionators.
8. The method as in any one of claims 1-7, wherein the process equipment comprises iron or iron alloys.
9. The method as in any one of claims 1-8, wherein the iron alloys comprise carbon steel, stainless steel, or nickel-chromium-iron alloys.
10. The method as in any one of claims 1-9, wherein the foulant comprises coke, sludge, corrosion products, polymers, and catalyst fines.
11. The method as in one of claims 1-10, wherein the fluid comprises at least a liquid hydrocarbon material.
12. The method as in one of claims 1-11, wherein the molybdenum-containing complex is added to the fluid from 1 ppm to 3000 ppm of the fluid volume.
13. The method as in one of claims 1-12, wherein the molybdenum-containing complex further comprises one or more, asphaltene inhibitors, paraffin inhibitors, scale inhibitors, emulsifiers, water clarifiers, dispersants, emulsion breakers, or any combination thereof.
14. The method as in one of claims 1-13, wherein the R_1 , R_2 , R_3 , and R_4 of formulae I and II comprise thiophosphates, phosphates and polymers thereof.
15. The method as in one of claims 1-13, wherein the Y^1 and Y^2 of formulae III and IV comprise thiocarbamates and polymers thereof.

16. The method as in one of claims 1-15, wherein the at least one molybdenum-containing complex comprises a molybdenum dithiocarbamate, dithiophosphate, polymers thereof and combinations thereof.
17. The method of claim 16, wherein the molybdenum dithiocarbamate comprises an alkyl dithiocarbamate.
18. The method of claim 17, wherein the alkyl dithiocarbamate comprises an ethyl hexyl dithiocarbamate, straight chain C6-C10 alcohols or mixtures thereof.
19. The method of claim 16, wherein the molybdenum dithiophosphate comprises an alkyl dithiophosphate.
20. The method of claim 19, wherein the alkyl dithiophosphate comprises an ethyl hexyl, straight chain C6-C10 alcohols or mixtures thereof.
21. The method as in one of claims 1-20 wherein the molybdenum-containing complex provides at least 70% inhibition of foulant deposition.
22. The method as in one of claims 1-21, wherein the molybdenum-containing complex provides at least 70% inhibition of foulant deposition in a SS304 mesh test.
23. The method as in one of claims 1-22, wherein the introducing the molybdenum-containing complex inhibits foulant deposition of a process equipment compared to a process equipment under the same conditions without the introduction of the molybdenum-containing complex.
24. A composition comprising at least one molybdenum-containing complex to inhibit deposition of a foulant in contact with process equipment, the at least one molybdenum-containing complex comprising the formula selected from Formula I, II, III or IV:

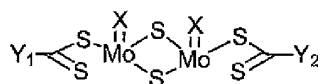


Formula I

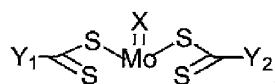


Formula II

wherein R_1 , R_2 , R_3 , and R_4 , are each a hydrocarbon group and wherein R_1 , R_2 , R_3 , and R_4 can be the same or different; and X is oxygen or sulfur and X can be the same or different.



Formula III



Formula IV

wherein Y_1 and Y_2 are each oxygen, nitrogen or carbon-containing ligands and Y^1 and Y^2 can be the same or different, and X is each oxygen or sulfur, and X can be the same or different from each other.

25. The composition of claim 24, wherein the composition further comprises one or more, asphaltene inhibitors, paraffin inhibitors, scale inhibitors, emulsifiers, water clarifiers, dispersants, emulsion breakers, or any combination thereof.
26. The composition as in one of claims 24-25, wherein the R_1 , R_2 , R_3 , and R_4 of formulae I and II comprise thiophosphates, phosphates and polymers thereof.
27. The composition as in one of claims 24-26, wherein the Y^1 and Y^2 of formulae III and IV comprise thiocarbamates and polymers thereof.
28. The composition as in one of claims 24-27, wherein the at least one molybdenum-containing complex comprises a molybdenum dithiocarbamate, dithiophosphate, polymers thereof and combinations thereof.
29. The composition of claim 28, wherein the molybdenum dithiocarbamate comprises an alkyl dithiocarbamate.
30. The composition of claim 29, wherein the alkyl dithiocarbamate comprises an ethyl hexyl dithiocarbamate, straight chain C6-C10 alcohols or mixtures thereof.
31. The composition of claim 28, wherein the molybdenum dithiophosphate comprises an alkyl dithiophosphate.

32. The method of claim 31, wherein the alkyldithiophosphate comprises an ethyl hexyl, straight chain C6-C10 alcohols or mixtures thereof.
33. The composition as in one of claims 24-32, wherein the molybdenum-containing complex is about 1 ppm to 3000 ppm of the composition.
34. A composition comprising:
a fluid; and
the at least one molybdenum-containing complex as in one of claims 24-33.
35. The composition as in one of claims 22-34, wherein the fluid is in contact in with coils, heat exchangers, transfer line exchangers quench coolers, furnaces, separation columns or fractionators.
36. The composition as in one of claims 24-35, wherein the fluid comprises at least a liquid hydrocarbon fraction.
37. The composition as in one of claims 24-36, wherein the hydrocarbon fraction is a distillate.
38. The composition as in one of claims 24-37, wherein the fluid temperature is 200°C to 1500°C.
39. A treated process equipment comprising:
a process equipment comprising a metal surface; and
the fluid source comprising the molybdenum-containing complex as in one of claims 24-38, wherein at least a portion of the metal surface is contacted by the fluid source.
40. The treated process equipment of claim 39, wherein the process equipment comprises iron or iron alloys.

41. The treated process equipment of claim 40, wherein the iron alloys comprise carbon steel, stainless steel, nickel-chromium-iron alloys, or other alloys.
42. The treated process equipment as in one of claims 39-41, wherein the metal containment comprises coils, heat exchangers, transfer line exchangers quench coolers, furnaces, separation columns or fractionators.
43. The treated process equipment as in one of claims 39-42, wherein the fluid comprises, at least liquid hydrocarbon fraction.
44. Use of the molybdenum-containing complex as in one of claims 1-43 to inhibit foulant deposition.