are very different than gas and diesel engines. Fourth, the high energy content of nitroparaffins requires modification of the engine, and additional care in transport, storage, and handling of both the nitroparaffin and the fuel containing the additive. Further, in some fuel applications, nitroparaffins have had a tendency to gel. The high cost, and extremely high energy content of nitroparaffins, has precluded their use as an automotive and/or truck fuel. Moreover, the extreme volatility and danger of explosion from nitromethane taught away from its use as a motor fuel for automobiles and/or trucks.

Summary

[0019a] In one aspect of the present disclosure, there is provided an additive formulation for a fuel comprising:

about 40 to about 65 weight percent nitropropane;

about 10 to about 30 weight percent nitromethane;

about 0.5 to about 5 weight percent C_5-C_{10} fatty acid ester comprising at least one of pentaerythritol and dipentaerythritol;

about 10 to about 40 weight percent aromatic hydrocarbon;

wherein the additive is substantially free of nitroethane.

Advantages of the Disclosure

[0020] It is an advantage of the present disclosure to provide a motor fuel additive that provides improved performance at additive concentrations typical of known additives, and reduced emissions at lower concentrations, while avoiding many of the problems associated with prior known additives and motor fuels.

[0021] Another advantage of the present disclosure is to provide a motor fuel that exhibits improved performance relative to prior known motor fuels, while avoiding many of the problems associated with prior known motor fuels.

[0022] A further advantage of the present disclosure is to provide a motor fuel that reduces emissions relative to prior known motor fuels, while avoiding many of the problems associated with prior known motor fuels.

[0023] Yet another advantage of the present disclosure is to provide a replacement for oxygenates, such as ethanol and MTBE.

[0024] Another advantage of the present disclosure is to provide a replacement for oxygenates, such as ethanol and MTBE that reduces emissions.

[0025] An additional advantage of the present disclosure is to provide an improved fuel formulation that reduces total hydrocarbon emissions.

[0026] Yet another advantage of the present disclosure is to provide an improved formulation that reduces non-methane hydrocarbon emissions.

[0027] Another advantage of the present disclosure is to provide an improved fuel formulation that reduces carbon monoxide emissions.

CLAIMS

We claim:

1. An additive formulation for a fuel comprising:
about 40 to about 65 weight percent nitropropane;
about 10 to about 30 weight percent nitromethane;
about 0.5 to about 5 weight percent C_5-C_{10} fatty acid ester comprising at least one of pentaerythritol and dipentaerythritol;
about 10 to about 40 weight percent aromatic hydrocarbon;
wherein the additive is substantially free of nitroethane.

~~1. An additive formulation for a fuel comprising:~~
~~nitroparaffin substantially free of nitroethane;~~
~~lubricant; and~~
~~aromatic hydrocarbon;~~
~~wherein combustion in an internal combustion engine of a fuel containing the additive results in reduced emissions relative to the combustion of a fuel not containing the additive.~~

~~2. The formulation of claim 1, wherein the nitroparaffin comprises at least one nitroparaffin selected from the group consisting of nitropropane and nitromethane.~~

~~3. The formulation of claim 1, wherein the nitroparaffin comprises about 40 to about 65 weight percent nitropropane.~~

~~4. The formulation of claim 1, wherein the nitroparaffin comprises about 10 to about 30 weight percent nitromethane.~~

~~5. The formulation of claim 2, wherein the nitroparaffin comprises about 40 to about 65 weight percent nitropropane and about 10 to about 30 weight percent nitromethane.~~

~~6. The formulation of claim 1, comprising from about 0.5 to about 5 weight percent lubricant.~~

~~7. The formulation of claim 1, wherein the lubricant is a polyester.~~

~~8. The formulation of claim 1, wherein the lubricant is a C_5-C_{10} fatty acid ester.~~

~~9. The formulation of claim 8, wherein the lubricant is a C_5-C_{10} fatty acid ester comprising at least one of pentaerythritol and dipentaerythritol.~~

~~10~~2. The formulation of claim ~~9~~1, wherein the lubricant is a C_5-C_{10} fatty acid ester with pentaerythritol.

~~11~~3. The formulation of claim ~~9~~1, wherein the lubricant is a C_5-C_{10} fatty acid ester with dipentaerythritol.

~~12~~4. The formulation of claim ~~9~~1, wherein the lubricant is a C_5-C_{10} fatty acid ester with pentaerythritol and dipentaerythritol.

~~13~~5. The formulation of claim ~~10~~2, ~~comprising~~ wherein the lubricant comprises about 75 wt.% to about 80 wt.% C_5-C_{10} fatty acid ester with pentaerythritol.

~~14~~6. The formulation of claim ~~11~~3, wherein the lubricant comprises ~~comprising~~ about 19 wt.% to about 24 wt.% C_5-C_{10} fatty acid ester with dipentaerythritol.

~~15. The formulation of claim 12, wherein the ratio of C_5-C_{10} fatty acid ester with pentaerythritol to C_5-C_{10} fatty acid ester with dipentaerythritol is about 1:2.5 to about 1:4.5.~~

~~16. The formulation of claim 1, comprising from about 10 to about 40 weight percent aromatic hydrocarbon.~~

~~17~~7. The formulation of claim 1, wherein the aromatic hydrocarbon is selected from the group consisting of: ethyl benzene, xylene, and toluene.

~~18~~8. The formulation of claim ~~14~~, wherein the aromatic hydrocarbon is toluene.

~~19. The formulation of claim 1, wherein the reduced emissions are comprised of at least one of total hydrocarbons, non-methane hydrocarbons, carbon monoxide, and NO_x.~~

~~20. The formulation of claim 1, wherein combustion in an internal combustion engine of a fuel containing the additive results in a reduction in particulate matter emissions relative to the combustion of a fuel not containing the additive.~~

~~21. The formulation of claim 1, wherein combustion in an internal combustion engine of a fuel containing the additive results in enhanced engine performance relative to the combustion of a fuel not containing the additive.~~

~~22. An additive formulation for a fuel comprising:~~
~~about 40 to about 65 weight percent nitropropane;~~
~~about 10 to about 30 weight percent nitromethane;~~
~~about 0.5 to about 5 weight percent lubricant;~~
~~about 10 to about 40 weight percent aromatic hydrocarbon;~~
~~wherein the additive is substantially free of nitroethane.~~

~~23. The formulation of claim 22, wherein the lubricant is a polyester.~~

~~24. The formulation of claim 22, wherein the lubricant is a C_5-C_{10} fatty acid ester, and the aromatic hydrocarbon is toluene.~~

~~25. The formulation of claim 22, wherein the aromatic hydrocarbon is toluene.~~

~~26. An additive formulation for a fuel comprising:~~
~~about 40 to about 65 weight percent nitropropane;~~
~~about 10 to about 30 weight percent nitromethane;~~
~~about 0.5 to about 5 weight percent C_5-C_{10} fatty acid ester;~~
~~about 10 to about 40 weight percent aromatic hydrocarbon;~~
~~wherein the additive is substantially free of nitroethane.~~

~~27. The formulation of claim 22, wherein combustion in an internal combustion engine of a fuel containing the additive results in reduced emissions, including particulate matter emissions, and enhanced engine performance, relative to the combustion of a fuel not containing the additive.~~

~~28. An additive formulation for a fuel comprising:~~
~~about 40 to about 65 weight percent nitropropane;~~
~~about 10 to about 30 weight percent nitromethane;~~
~~about 0.5 to about 5 weight percent C_5-C_{10} fatty acid ester with pentaerythritol and dipentaerythritol;~~
~~about 10 to about 40 weight percent toluene;~~
~~wherein the additive is substantially free of nitroethane.~~

~~29. A fuel comprising the additive of claim 1.~~