CLAIMS

1. An isobutylene-based polymer composition comprising:

(a) an isobutylene-based functionalized polymer; and

(b) one of or a combination of any of the following:

(i) a sulfur donor which is selected from the group consisting of tetramethyl thiuram disulfide ("TMTD"), 4,4'-dithiodimorpholine, dipentamethylene thiuram tetrasulfide ("DPTT"), and thiocarbamyl sulfonamide;

(ii) a blend of sulfur and a sulfur donor; and

(iii) an accelerator cure system.,

wherein the isobutylene-based functionalized polymer is a modified poly(isobutylene-co-para-methylstyrene) amine-ionomer, wherein the amine ionomer comprises a 1°, 2°, or 3° amine nucleophile with one or more pendant vinyl groups, or

wherein the isobutylene-based functionalized polymer is a modified poly(isobutylene-co-para-methylstyrene)-phosphine ionomer, wherein the phosphine ionomer comprises diphenylphosphinostyrene, allyldiphenylphosphine, diallylphenylphosphine, diphenylvinylphosphine, triallyphosphosphine, or combinations thereof, and

wherein the composition has less than 0.01 wt % zinc based on the total weight of the composition.

~~2. The isobutylene-based polymer composition of claim 1, wherein the isobutylene-based functionalized polymer is a modified poly(isobutylene-co-para-methylstyrene) amine-ionomer, wherein the amine ionomer is selected from the group consisting of 1°, 2°, and 3° amine nucleophiles with one or more pendant vinyl groups.~~

~~3.~~2. The isobutylene-based polymer composition of claim ~~2~~ 1, wherein the amount of the amine ionomer present in the functionalized polymer is about 0.5 wt % to about 50 wt % based on the total weight of the functionalized polymer.

~~4. The isobutylene-based polymer composition of claim 1, wherein the isobutylene-based functionalized polymer is a modified poly(isobutylene-co-para-methylstyrene) phosphine~~

~~ionomer, wherein the phosphine ionomer is selected from diphenylphosphinostyrene, allyldiphenylphosphine, diallylphenylphosphine, diphenylvinylphosphine, triallyphosphosphine, and combinations thereof.~~

~~5.~~3. The isobutylene-based polymer composition of claim 4 1, wherein the amount of the phosphine ionomer present in the functionalized polymer is about 0.5 wt % to about 50 wt % based on the total weight of the functionalized polymer.

~~6. The isobutylene based polymer composition of any preceding claim, further comprising at least one filler.~~

~~7. The isobutylene-based polymer composition of any preceding claim, wherein the sulfur donor is selected from the group consisting of tetramethyl thiuram disulfide ("TMTD"), 4,4'-dithiodimorpholine, dipentamethylene thiuram tetrasulfide ("DPTT"), and thiocarbamyl sulfonamide.~~

~~8.~~4. The isobutylene-based polymer composition of any preceding claim, wherein the accelerator cure system comprises one or more of thiazoles, amines, guanidines, sulfenamides, thiurams, dithiocarbamates, and/or zanthates.

~~9. The isobutylene-based polymer composition of claim 8, wherein the accelerator cure system is N-cyclohexyl-2-benzothiazole sulfenamide ("CBS") or diphenylguanidine ("DPG").~~

~~10. The isobutylene-based polymer composition of claims 6-9, wherein the filler is selected from the group of carbon black, white filler, and combinations thereof.~~

~~11. The isobutylene based polymer composition of any preceding claim, wherein the composition is useful as a thermoset in pharmaceutical and tire applications.~~

~~12.~~5. A thermoset composition comprising:

(a) an isobutylene-based functionalized polymer; and

(b) one of or a combination of any of the following:

(i) a sulfur donor which is selected from the group consisting of tetramethyl thiuram disulfide ("TMTD"), 4,4'-dithiodimorpholine, dipentamethylene thiuram tetrasulfide ("DPTT"), and thiocarbamyl sulfonamide;

(ii) a blend of sulfur and a sulfur donor; and

(iii) an accelerator cure system;

wherein the isobutylene-based functionalized polymer is a modified poly(isobutylene-co-para-methylstyrene) amine-ionomer, wherein the amine ionomer comprises a 1°, 2°, or 3° amine nucleophile with one or more pendant vinyl groups, or

wherein the isobutylene-based functionalized polymer is a modified poly(isobutylene-co-para-methylstyrene)-phosphine ionomer, wherein the phosphine ionomer comprises diphenylphosphinostyrene, allyldiphenylphosphine, diallylphenylphosphine, diphenylvinylphosphine, triallyphosphosphine, or combinations thereof, and

wherein the composition is substantially free of zinc.

~~13. The thermoset composition of claim 12, wherein the isobutylene-based functionalized polymer is a modified poly(isobutylene-co-para-methylstyrene) amine-ionomer, wherein the amine ionomer is selected from the group consisting of 1°, 2°, and 3° amine nucleophiles with one or more pendant vinyl groups.~~

~~14. The thermoset composition of claim 13, wherein the amount of the amine ionomer present in the functionalized polymer is about 0.5 wt % to about 50 wt % based on the total weight of the functionalized polymer.~~

~~15. The thermoset composition of claim 12, wherein the isobutylene-based functionalized polymer is a modified poly(isobutylene-co-para-methylstyrene) phosphine ionomer, wherein the phosphine ionomer is selected from diphenylphosphinostyrene, allyldiphenylphosphine, diallylphenylphosphine, diphenylvinylphosphine, triallyphosphosphine, and combinations thereof.~~

16. The thermoset composition of claim 15, wherein the amount of the phosphine ionomer present in the functionalized polymer is about 0.5 wt % to about 50 wt % based on the total weight of the functionalized polymer.

17. The thermoset composition of claims 12-16, further comprising at least one filler.

18. The thermoset composition of claims 12-17, wherein the sulfur donor is selected from the group consisting of tetramethyl thiuram disulfide ("TMTD"), 4,4' dithiodimorpholine, dipentamethylene thiuram tetrasulfide ("DPTT"), and thiocarbamyl sulfonamide.

19. The thermoset composition of claims 12-18, wherein the accelerator cure system comprises one or more of thiazoles, amines, guanidines, sulfenamides, thiurams, dithiocarbamates, and/or zanthates.

20. The thermoset composition of claim 19, wherein the accelerator cure system is N-cyclohexyl 2-benzothiazole sulfenamide ("CBS") or diphenylguanidine ("DPG").

21. The thermoset composition of claims 17-20, wherein the filler is selected from the group of carbon black, white filler, and combinations thereof.

22. A rubber composition comprising the thermoset composition of claims 12-21.

23. The rubber composition of claim 22 further comprising a hydrocarbon resin.

24. An article comprising the rubber composition of claims 22-23.