Claims

1. A crosslinkable polymer composite comprising a silane-grafted thermoplastic polymer blend formed from silane grafting a polymer blend, which includes ethylene/alpha-olefin plastomer and polyethylene; and metal hydroxide flame retardant selected from magnesium, calcium, zinc or aluminum hydroxide or mixtures thereof;

wherein the crosslinkable polymer composite comprises about 40 to 60 wt.% of the silane-grafted thermoplastic polymer blend; and about 40 to 60 wt.% of the metal hydroxide flame retardant, which comprises precipitated magnesium dihydroxide.

2. The crosslinkable polymer composite of claim 1 comprising about 40 to 50 wt.% of the silane-grafted thermoplastic polymer blend; and about 45 to 60 wt.% of the metal hydroxide flame retardant.

3. The crosslinkable polymer composite of claim 1, wherein the metal hydroxide flame retardant is precipitated magnesium dihydroxide having a d_{50} of about 0.5 - 2 microns, a BET of about 1 - 15 m^2/g and/or a bulk density of about 300 - 600 g/L.

4. The crosslinkable polymer composite of claim 3 comprising 100 parts by weight of the silane-grafted thermoplastic polymer blend; and about 75 to 150 parts by weight of the precipitated magnesium dihydroxide flame retardant.

5. The crosslinkable polymer composite of claim 3, wherein the silane-grafted polymer blend is formed by reacting a mixture which includes the ethylene/alpha-olefin plastomer, linear low density polyethylene, vinyl alkoxysilane and a free radical initiator; and the composite is formed by compounding the silane-grafted polymer blend with the metal hydroxide flame retardant and other optional additives to provide a compounded mixture; and extruding the compounded mixture to form a halogen free, flame-retardant, crosslinkable polymer composite.

6. The crosslinkable polymer composite of claim 1, wherein the ethylene/alpha-olefin plastomer has an MFI at 190 °C of about 1-5 g/10 min (as determined pursuant to ISO 1133); and the polyethylene is a linear low density polyethylene having an MFI at 190 °C of about 1-5 g/10 min (as determined pursuant to ISO 1133).

7. The crosslinkable polymer composite of claim 6, wherein the ethylene/alpha-olefin plastomer is an ethylene/1-octene plastomer having a melting temperature of about 70 to 80 °C (as determined pursuant to ISO 11357) and/or a Shore D Hardness of no more than about 30 (as determined pursuant to ISO 868).

8. The crosslinkable polymer composite of claim 6, wherein the linear low density polyethylene has a melting temperature of about 120 to 130 °C, an MFI at 190 °C of about 1-5 g/10 min (as determined pursuant to ISO 1133), and a density of about 0.91 to 0.93 g/cm^3.

9. The crosslinkable polymer composite of claim 1, wherein the polymer blend comprises about 40 to 60 wt.% of the ethylene/alpha-olefin plastomer and about 40 to 60 wt.% of a linear low density polyethylene.

10. The crosslinkable polymer composite of claim 1, wherein the composite comprises about 40 to 50 wt.% of the silane-grafted thermoplastic polymer blend; and about 45 to 60 wt.% of the precipitated magnesium dihydroxide;

wherein the polymer blend comprises about 40 to 60 wt.% of the ethylene/alpha-olefin plastomer, which comprises a ethylene/1-octene plastomer having an MFI of about 1-5 g/10 min (as determined pursuant to ISO 1133); and about 40 to 60 wt.% of a linear low density polyethylene having an MFI at 190 °C of about 1 to 5 g/10 min (as determined pursuant to ISO 1133) and a density of 0.91 to 0.93 g/cm^3.

11. The crosslinkable polymer composite of claim 10, wherein an insulation material formed from the crosslinkable polymer composite has an elongation before aging of at least about 150% (1500 lbf/in^2) (as determined pursuant to UL 44 Clause 4.2 & UL 44, Table 11); a tensile strength before aging of at least about 10 MPa (1500 lbf/in^2) (as determined pursuant to UL 44 Clause 4.2 & UL 44, Table 11); and maintains long term insulation resistance after being exposed to water at 90 °C for at least 24 weeks (as determined pursuant to UL 44 Clause 5.4).

12. A substantially halogen-free, crosslinkable polymer composite comprising:

40 to 50 wt.% of a polymer component including silane-grafted ethylene/alpha-olefin plastomer and/or silane-grafted thermoplastic polyethylene; and optionally, includes ethylene/alpha-olefin plastomer and/or thermoplastic polyethylene; and

45 to 60 wt.% precipitated magnesium dihydroxide having average particle size of no more than about 2 microns.

13. The crosslinkable polymer composite of claim 12, wherein the polymer component comprises one or more of a silane-grafted ethylene/1-octene plastomer and a silane-grafted linear low density polyethylene.

14. The crosslinkable polymer composite of claim 12, wherein the polymer component comprises about 40 to 60 wt.% silane-grafted ethylene/1-octene plastomer and about 40 to 60 wt.% silane-grafted linear low density polyethylene.

15. The crosslinkable polymer composite of claim 12, wherein an insulation material formed from the crosslinkable polymer composite has a tensile strength before aging of at least about 10 MPa (1500 lbf/in^2) (as determined pursuant to UL 44 Clause 4.2 & UL 44, Table 11).

16. The crosslinkable polymer composite of claim 12, wherein an insulation material formed from the crosslinkable polymer composite has an elongation before aging of at least about 150% (1500 lbf/in^2) (as determined pursuant to UL 44 Clause 4.2 & UL 44, Table 11).

17. The crosslinkable polymer composite of claim 12, wherein an insulation material formed from the crosslinkable polymer composite maintains long term insulation resistance after being exposed to water at 90 °C for at least 24 weeks (as determined pursuant to UL 44 Clause 5.4).

18. A halogen-free, crosslinkable polymer composite comprising about 40 to 60 wt.% of a silane-grafted thermoplastic polymer blend; and about 40 to 60 wt.% precipitated magnesium dihydroxide;

wherein the silane-grafted thermoplastic polymer blend is formed from silane grafting a polymer blend, the polymer blend including about 40 to 60 wt.% ethylene/1-octene plastomer and about 40 to 60 wt.% linear low density polyethylene; and

the precipitated magnesium dihydroxide comprises about 40 to 75 wt.% of a first precipitated magnesium dihydroxide having a d_{50} of about 1.5 - 2 microns and a BET of about 2 - 5 m^2/g; and about 25 to 60 wt.% of a second precipitated magnesium dihydroxide having a d_{50} of about 0.7 - 1.2 microns and a BET of about 8 - 12 m^2/g.

19. The crosslinkable polymer composite of claim 18, wherein the ethylene/1-octene plastomer has an MFI at 190 °C of about 1-5 g/10 min and a melting temperature of about 70 to 80 °C; and the linear low density polyethylene has a melting temperature of about 120 to 130 °C and an MFI at 190 °C of about 1-5 g/10 min.

20. The crosslinkable polymer composite of claim 19, wherein an insulation material formed from the crosslinkable polymer composite has an elongation before aging of at least about 150% (1500 lbf/in^2) (as determined pursuant to UL 44 Clause 4.2 & UL 44, Table 11); a tensile strength before aging of at least about 10 MPa (1500 lbf/in2) (as determined pursuant to UL 44 Clause 4.2 & UL 44, Table 11); and maintains long term insulation resistance after being exposed to water at 90 °C for at least 24 weeks (as determined pursuant to UL 44 Clause 5.4).