CLAIMS

1. A polymer comprising:

(a) a copolymer backbone comprising units derived from an isoolefin having from 4 to 7 carbons and an alkylstyrene; and

(b) one or more branches comprising a polycyclic aromatic hydrocarbon,

wherein the one or more branches are directly bonded to an aromatic moiety of the copolymer backbone.

2. The polymer of claim 1, wherein the polycyclic aromatic hydrocarbon is polynuclear.

3. The polymer of claim 2, wherein the polycyclic aromatic hydrocarbon is selected from the group consisting of naphthalenes, anthracenes, phenanthrenes, pyrenes, benzopyrenes, coronenes, ovalenes, and combinations thereof.

4. The polymer of any one of claims 1 to 3, wherein the copolymer backbone is poly(isobutylene-co-p-methylstyrene) (IMSM).

5. The polymer of any one of claims 1 to 4, wherein the one or more branches are covalently bound to the aromatic moiety via a ketone group.

6. The polymer of claim 5, wherein the polymer comprises the reaction product of:

(a) a copolymer comprising units derived from an isoolefin having from 4 to 7 carbons and an alkylstyrene; and

(b) an acyl halide and/or acid anhydride functionalized polycyclic aromatic hydrocarbon.

7. A method comprising:

(a) contacting (i) a copolymer comprising units derived from an isoolefin having from 4 to 7 carbons and an alkylstyrene and (ii) an acyl halide and/or acid anhydride functionalized polycyclic aromatic hydrocarbon in the presence of a catalyst at a temperature of about 80°C to about 200°C; and

(b) recovering a polymer product.

8. The method of claim 7, wherein the catalyst is a Lewis acid.

9. The method of claim 7 or 8, wherein the polycyclic aromatic hydrocarbon is polynuclear.

10. The method of any one of claims 7 to 9, wherein the polycyclic aromatic hydrocarbon is covalently bound to an aromatic moiety of the copolymer via a ketone group.

11. The method of any one of claims 7 to 10, wherein the copolymer is IMSM.

12. The method of any one of claims 7 to 11, further comprising:
(c) combining the polymer product with (i) at least one halogenated elastomer component comprising units derived from an isoolefin having from 4 to 7 carbons and (ii) at least one nanofiller; and
(d) recovering an elastomeric nanocomposite composition.

13. The method of claim 12, wherein the nanofiller is selected from the group consisting of graphite, expanded graphite, nano graphene platelets (NGPs), graphene, and mixtures thereof, and/or wherein the halogenated elastomer component is selected from the group consisting of chlorinated poly(isobutylene-co-isoprene) (CIIR), brominated poly(isobutylene-co-isoprene) (BIIR), and mixtures thereof.

14. The method of claim 13, wherein the oxygen permeability of the nanocomposite composition at 40°C is at least 15% lower than the permeability of the halogenated elastomer component.

15. A composition comprising:
(a) a polymer comprising (i) a copolymer backbone comprising units derived from an isoolefin having from 4 to 7 carbons and an alkylstyrene and (ii) one or more ranches comprising a polycyclic aromatic hydrocarbon, wherein the one or more branches are directly bonded to an aromatic moiety of the copolymer backbone;
(b) at least one halogenated elastomer component comprising units derived from an isoolefin having from 4 to 7 carbons; and
(c) at least one nanofiller,

wherein the polymer is present at from about 0.5 to about 45 wt% based on the total weight of the polymer, the halogenated elastomer component, and the nanofiller,
and wherein the nanofiller is present at from about 0.01 to about 15.0 wt% based on the total weight of the polymer, the halogenated elastomer component, and the nanofiller.

16. The composition of claim 15, wherein the polycyclic hydrocarbon is polynuclear.

17. The composition of claim 15 or 16, wherein the copolymer backbone is IMSM.

18. The composition of any one of claims 15 to 17, wherein the one or more branches are covalently bound to the aromatic moiety via a ketone group.

19. The composition of any one of clams 15 to 18, wherein the nanofiller is selected from the group consisting of graphite, expanded graphite, NGPs, graphene, and mixtures thereof.

20. The composition of any one of claims 15 to 19, wherein the halogenated elastomer component is selected from the group consisting of CIIR, BIIR, and mixtures thereof.

21. The composition of claim 20, wherein the oxygen permeability of the composition at 40°C is about 15% lower than the permeability of the halogenated elastomer component.

22. The composition of any one of claims 15 to 21, further comprising at least one component selected from the group consisting of additional fillers, processing oils, cure additives, and mixtures thereof, wherein the cure additives are selected from the group consisting of metal oxides, organic acids, alkyl disulfides, and mixtures thereof.

23. An innerliner for a tire comprising the composition of any one of claims 15 to 22.

24. A tire comprising the polymer of any one of claims 1 to 6, or the composition of any one of claims 15 to 22.

25. The use of the polymer of any one of claims 1 to 6, as a nanofiller dispersant in an elastomeric nanocomposite composition.