The invention claimed is:

1. An exfoliated, polyolefin/clay nanocomposite material comprising:

the reaction product of reactants consisting essentially of: a clay having a layered structure, and a functionalized polyolefin material having the general formula:

$$—(M)_n—X—F$$

wherein M is an olefinic monomer, n is an integer in the range of 100 to 100,000, F is a hydrophilic group capable of binding to said clay, and X is optional and is a linker group;

said polyolefin/clay nanocomposite having an exfoliated structure.

2. The polyolefin/clay nanocomposite of claim 1, wherein F is selected from the group consisting of: OH, COOR, NR_2,

NR^+_3, an anhydride, an imidazolinium, sulfonium, and phosphonium, wherein said R groups are, independently, H or alkyl.

3. The polyolefin/clay nanocomposite of claim 1, wherein X is a residue of a chain transfer agent or a termination agent.

4. The polyolefin/clay nanocomposite of claim 3, wherein X is an alkoxyl group, an alkyl group or an alkyl-aryl group.

5. The polyolefin/clay nanocomposite of claim 1, wherein said clay is a silicate clay.

6. The polyolefin/clay nanocomposite of claim 5, wherein the layered silicate clay is selected from phyllosilicate clays, layered silicates, layered fiber silicates, montmorillonite, nontronite, beidellite, hectorite, saponite, sauconite, vermiculite, ledikite, magadiite, kenyaite, fluoromica, fluorohectorite, attapulgite, boehmite, imogolite, sepiolite, kaolinite, kadinite, synthetic equivalents, and combinations thereof.

7. The polyolefin/clay nanocomposite of claim 5, wherein the layered silicate clay is an organophilic clay that has been treated with a cationic-organic surfactant.

8. The polyolefin/clay nanocomposite of claim 7, wherein said cationic-organic surfactant is an alkyl ammonium compound.

9. The polyolefin/clay nanocomposite of claim 5, wherein the layered silicate clay is an acidic clay that has been treated with an acid.

10. The polyolefin/clay nanocomposite of claim 1, wherein M is selected from the group consisting of: ethylene, propylene, 1-butene, isobutylene, 1-pentene, 1-hexene, 1-octene, 3-methyl-1-butene, 4-methyl-1-pentene, cyclopentene, norbornene, phenylnorbornene, indanylnorbornene, styrene, p-methylstyrene, butadiene, isoprene, 1-4 hexadiene, 1-5 hexadiene, divinylbenzene, vinylidenenorbornene, and combinations thereof.

11. The polyolefin/clay nanocomposite of claim 1, wherein the functionalized polyolefin material is a functionalized polypropylene having a terminal functional group selected from the group consisting of OH, NH_2, anhydride, ammonium, immidazolium, sulfonium, phosphonium cations, and molecular weight at least 10,000.

12. The polyolefin/clay nanocomposite of claim 1, wherein the functionalized polyolefin material is a functionalized polyethylene having a terminal functional group selected from the group consisting of OH, NH_2, anhydride, ammonium, immidazolium, sulfonium, phosphonium cations, and molecular weight at least 10,000.

13. The polyolefin/clay nanocomposite of claim 1, wherein the functionalized polyolefin material is a functionalized syndiotactic polystyrene containing a terminal functional group selected from the group consisting of OH, NH_2, anhydride, ammonium, immidazolium, sulfonium, phosphonium cations, and molecular weight at least 10,000.

14. The polyolefin/clay nanocomposite of claim 1, wherein the functionalized polyolefin material is a functionalized poly(ethylene-co-styrene) random copolymer having styrene content between 10 and 40 mole %, and a terminal functional group selected from the group consisting of OH, NH_2, anhydride, ammonium, immidazolium, sulfonium, phosphonium cations, and molecular weight at least 10,000.

15. The polyolefin/clay nanocomposite of claim 1, wherein the functionalized polyolefin material is a functionalized poly(isobutylene-co-isoprene) elastomer having isoprene content of up to 10 mole %, and a terminal functional group selected from the group consisting of OH, NH_2, anhydride, ammonium, immidazolium, sulfonium, phosphonium cations, and molecular weight at least 10,000.

16. The polyolefin/clay nanocomposite of claim 1, wherein the functionalized polyolefin material is a functionalized ethylene/propylene/diene elastomer having diene content up to 10 mole %; and a terminal functional group selected from the group consisting of OH, NH_2, anhydride, ammonium, immidazolium, sulfonium, phosphonium cations, and molecular weight at least 10,000 wherein the diene comprises 1,4-hexadiene, divinylbenzene, or vinylidenenorborene.

17. The polyolefin/clay nanocomposite of claim 1, further including an ancillary ingredient selected from the group consisting of pigments, fillers, reinforcing fibers, carbon particles, stabilizers, dyes, plasticizers, fire retardants, and combinations thereof.

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