CLAIMS

1. A process for producing a copolymer, the process comprising contacting at least one isoolefin monomer with at least one multiolefin and/or β-pinene monomer in the presence of at least one Lewis acid and at least one initiator, and in a diluent comprising a tetrafluorinated propene.

2. The process according to claim 1, wherein the tetrafluorinated propene comprises 1,3,3,3-tetrafluoro-1-propene (HFO-1234ze), 2,3,3,3-tetrafluoro-1-propene (HFO-1234yf), 1,1,3,3-tetrafluoro-1-propene, 1,1,2,3-tetrafluoro-1-propene, 1,2,3,3-tetrafluoro-1-propene, or mixtures thereof.

3. The process according to claim 1, wherein the tetrafluorinated propene comprises 1,3,3,3-tetrafluoro-1-propene (HFO-1234ze), 2,3,3,3-tetrafluoro-1-propene (HFO-1234yf), or mixtures thereof.

4. The process according to claim 1, wherein the tetrafluorinated propene comprises 2,3,3,3-tetrafluoro-1-propene (HFO-1234yf).

5. The process according to claim 1, wherein the at least one isoolefin monomer comprises an isoolefin having from 4 to 16 carbon atoms.

6. The process according to claim 1, wherein the at least one isoolefin monomer comprises an isoolefin having from 4 to 7 carbon atoms.

7. The process according to claim 1, wherein the at least one isoolefin monomer comprises isobutene, 2-methyl-1-butene, 3-methyl-1-butene, 2-methyl-2-butene, 4-methyl-1-pentene, or mixtures thereof.

8. The process according to claim 1, wherein the at least one multiolefin and/or β-pinene monomer comprises a multiolefin having from 4-14 carbon atoms.

9. The process according to claim 1, wherein the at least one multiolefin and/or β-pinene monomer comprises isoprene, butadiene, 2-methylbutadiene, 2,4-dimethylbutadiene, piperyline, 3-methyl-1,3-pentadiene, 2,4-hexadiene, 2-neopentylbutadiene, 2-methyl-1,5-

hexadiene, 2,5-dimethyl-2,4-hexadiene, 2-methyl-1,4-pentadiene, 2-methyl-1,6-heptadiene, cyclopentadiene, methylcyclopentadiene, cyclohexadiene, 1-vinyl-cyclohexadiene or mixtures thereof.

10. The process according to claim 1, wherein the at least one multiolefin and/or β-pinene monomer comprises indene, α-Methyl styrene, p-methyl styrene, chlorostyrene or mixtures thereof.

11. The process according to claim 1, wherein the at least one multiolefin and/or β-pinene monomer comprises p-methyl styrene.

12. The process according to claim 1, further comprising contacting at least one additional monomer with the at least one isoolefin monomer and the at least one multiolefin and/or β-pinene monomer.

13. The process according to claim 12, wherein the at least one additional monomer comprises indene, α-Methyl styrene, p-methyl styrene, chlorostyrene or mixtures thereof.

14. The process according to claim 1, wherein the Lewis acid comprises ethyl aluminum dichloride (EADC), diethyl aluminum chloride (DEAC) and/or mixtures thereof.

15. The process according to claim 1, wherein the initiator comprises a proton source and/or cationogen.

16. The process according to claim 1, wherein the monomers are polymerized at a temperature in a range of about -120° C. to about -50° C., preferably, in a range of about -100° C. to about -75° C., preferably in a range of about -98° C. to about -90° C. or preferably about -95° C. or about -75° C.

17. The process according to claim 1, wherein the diluent further comprises methyl chloride.

18. The process according to claim 17, wherein a ratio of methyl chloride to tetrafluorinated propene in the diluent is about 50:50.

19. The process according to claim 1, wherein:

the tetrafluorinated propene comprises 2,3,3,3-tetrafluoro-1-propene (HFO-1234yf);

the at least one isoolefin monomer comprises isobutene, 2-methyl-1-butene, 3-methyl-1-butene, 2-methyl-2-butene, 4-methyl-1-pentene, or mixtures thereof;

the at least one multiolefin and/or β-pinene monomer comprises isoprene, butadiene, 2-methylbutadiene, 2,4-dimethylbutadiene, piperyline, 3-methyl-1,3-pentadiene, 2,4-hexadiene, 2-neopentylbutadiene, 2-methyl-1,5-hexadiene, 2,5-dimethyl-2,4-hexadiene, 2-methyl-1,4-pentadiene, 2-methyl-1,6-heptadiene, cyclopentadiene, methylcyclopentadiene, cyclohexadiene, 1-vinyl-cyclohexadiene, indene, α-Methyl styrene, p-methyl styrene, chlorostyrene, or mixtures thereof;

the Lewis acid comprises ethyl aluminum dichloride (EADC), diethyl aluminum chloride (DEAC) and/or mixtures thereof;

the initiator comprises a proton source and/or a cationogen;

the monomers are polymerized at a temperature of about -98° C. to about -75° C.; and

the diluent further comprises methyl chloride, wherein a ratio of methyl chloride to 2,3,3,3-tetrafluoro-1-propene in the diluent is about 50.50.

20. A copolymer produced by the process as defined in claim 1.