CLAIMS

What we claim is:

1. A method for pelletizing a molten polymer feed having a viscosity of less than 35,000 cP at 190 °C, comprising:

(a) introducing the molten polymer feed into ~~an~~ a cooling extruder;

(b) cooling the molten polymer feed while in the extruder to raise the viscosity of the polymer feed to at least 5000 cP; and

(c) extruding the cooled polymer feed through a pelletizing die.

2. The method of claim 1 wherein the polymer feed is substantially free of blowing agents.

3. The method of any preceding claim wherein the polymer feed comprises at least one propylene component.

4. The method of any preceding claim wherein the polymer feed is substantially free of styrene.

5. The method of any preceding claim wherein the polymer feed comprises at least 50 mol% of one or more C_3 to C_{40} olefins where the polymer has

(a) a Dot T-Peel of 1 Newton or more on Kraft paper;

(b) a Mw of 10,000 to 100,000;

(c) a branching index (g') of from 0.4 to 0.98 measured at the Mz of the polymer when the polymer has a Mw of 10,000 to 70,000, or a branching index (g') of from 0.4 to 0.95 measured at the Mz of the polymer when the polymer has a Mw of 10,000 to 100,000;

(d) a heat of fusion of 1 to 70 J/g; and

(e) a heptane insoluble fraction of 70 weight% or less, based upon the weight of the polymer, where the heptane insoluble fraction has branching index (g') of 0.9 or less as measured at the Mz of the polymer.

6. The method of any preceding claim wherein the polymer feed comprises at least one additive chosen from the group comprising an antioxidant, tackifier, wax, oil, or plasticizer.

7. The method of any preceding claim wherein the additive comprises about 50% or less of the total weight of the polymer feed.

8. The method of any preceding claim wherein the extruder comprises a single screw or a double screw.

9. The method of any preceding claim wherein the polymer feed has a heat of fusion (ΔH) less than 90 J/g.

10. The method of any preceding claim wherein at least one component of the polymer feed has a Mw of less than 70,000.

11. The method of any preceding claim wherein the extruder generates at least 250 psi of driving force.

12. The method of any preceding claim wherein the extruder is operating at an outlet temperature less than the ring and ball softening temperature of the polymer feed and greater than the crystallization temperature of the polymer feed.

13. The method of any preceding claim wherein the polymer feed is cooled to a temperature near the crystallization temperature of the polymer feed while in the extruder and the extruder increases the dispersive homogeneity of the polymer melt.

14. An apparatus for the method of any one of claims 1-13 for pelletizing a molten polymer feed, comprising:

(a) ~~an~~ a cooling extruder comprising an inlet, a barrel, and an outlet;

(b) a heat removing device adapted to remove heat from the barrel of the extruder; and

(c) an underwater pelletizing die attached to the outlet of the extruder;

wherein the polymer feed flows through the extruder barrel and the heat removing device removes heat from the polymer feed to raise the viscosity of the polymer feed to at least 5000 cP~~.~~; and wherein the extruder is operating at an outlet temperature less than the ring and ball softening point but equal to or above the crystallization temperature of the polymer feed.

15. The apparatus of claim 14 further comprising a centrifugal dryer, wherein the centrifugal dryer is attached to the outlet of the underwater pelletizing die.

16. The apparatus of any one of claims 14 to 15 wherein the extruder is a co-rotating twin screw extruder.

17. The apparatus of any one of claims 14 to 16 wherein the extruder generates at least 250 psi of driving force.

~~18. The apparatus of any one of claims 14 to 17 wherein the extruder is operating at an outlet temperature less than the ring and ball softening point but equal to or above the crystallization temperature of the polymer feed.~~