Claims

1. A method of maintaining a target value of a melt flow index of a polyethylene polymer product having at least 50 wt% ethylene-derived units being synthesized with a metallocene catalyst in a fluidized bed gas phase reactor, the method comprising:

producing the polyethylene polymer product at the target value of the melt flow index with a metallocene catalyst in a fluidized bed gas phase reactor at a steady state in which the fluidized bed gas phase reactor is at a first reactor temperature and receives feeds of hydrogen and ethylene at a hydrogen to ethylene feed ratio at a first ratio value;

detecting a second reactor temperature that is different from the first reactor temperature; and

changing the hydrogen feed relative to the ethylene feed so as to change the hydrogen to ethylene feed ratio from the first ratio value to a second ratio value upon detecting the second reactor temperature to adjust a hydrogen concentration in the fluidized bed gas phase reactor, wherein the second ratio value of the hydrogen to ethylene feed ratio is calibrated to maintain the melt flow index value of the polyethylene polymer product at or within 20% of the target value, where the melt flow rate index is measured according to ASTM-D-1138E (190^{o}C, 2.16 kg) .

2. The method of claim 1, wherein detecting the second reactor temperature that is different from the first reactor temperature includes detecting that the second reactor temperature is less than the first reactor temperature; and

wherein changing the hydrogen feed relative to the ethylene feed so as to change the hydrogen to ethylene feed ratio includes increasing the hydrogen feed relative to the ethylene feed so as to increase the hydrogen to ethylene feed ratio from the first ratio value to the second ratio value after detecting that the second reactor temperature is less than the first reactor temperature to increase the hydrogen concentration in the fluidized bed gas phase reactor and is calibrated to maintain the melt flow index value of the polyethylene polymer product at or within 20% of the target value.

3. The method of claim 1, wherein detecting the second reactor temperature that is different from the first reactor temperature includes detecting that the second reactor temperature is greater than the first reactor temperature; and

wherein changing the hydrogen feed relative to the ethylene feed so as to change the hydrogen to ethylene feed ratio includes decreasing the hydrogen feed relative to the ethylene feed so as to decrease the hydrogen to ethylene feed ratio from the first ratio value to the second ratio value after detecting that the second reactor temperature is greater than the first reactor temperature to decrease the hydrogen concentration in the fluidized bed gas phase reactor and is calibrated to maintain the melt flow index value of the polyethylene polymer product at or within 20% of the target value.

4. The method of any one of claims 1-3, wherein during or after detecting the second reactor temperature that is different from the first reactor temperature the method further includes determining a direction of movement of a hydrogen to ethylene gas ratio in the fluidized bed gas phase reactor.

5. The method of any one of claims 1-4, wherein the metallocene catalyst is a Hf based metallocene catalyst.