such that the residual hydrocarbon content in the final degassed polymer is reduced below a particular, low, level, regardless of the polymer being degassed.

SUMMARY

In one aspect, there is provided a process for the production of a degassed polymer powder, which process comprises

a) feeding

i) a principal monomer, and

ii) one or more comonomers fed in an amount of at least 5000ppmw relative to the principal monomer feed rate, and

iii) optionally one or more added alkanes having 2 to 10 carbon atoms, fed in an amount of at least 1000ppmw relative to the principal monomer feed rate;

into a polymerisation reactor wherein the monomer and comonomers react to form a polymer comprising residual hydrocarbons comprising one or more hydrocarbons having 3 to 10 carbon atoms, and

b) passing the polymer to a degassing step wherein it is contacted with a purge gas to remove at least some of the residual hydrocarbons,

characterised in that:

1) the G/P ratio in the degassing step is higher than a minimum G/P ratio, G being the purge gas mass flow rate in the degassing step and P being the polymer throughput of the degassing step, and

2) the purge gas has a concentration of critical hydrocarbon component which is lower than a maximum concentration of said critical hydrocarbon component in the purge gas, the critical hydrocarbon component being the heaviest hydrocarbon component selected from (i), (ii) and (iii) fed in step (a),

which minimum G/P ratio and maximum concentration of said critical hydrocarbon component in the purge gas have been calculated based on the absorption coefficient, Kh, for the polymer powder to be degassed, and wherein the minimum G/P ratio is 1.25*X, where X = 28/Mw/100* Kh * Ptot / Psat(T) and the maximum concentration of said critical hydrocarbon component in the purge gas is Y, where Y = 100*(Psat(T)/Ptot/Kh) * Z

where:

T is the polymer powder temperature at the polymer exit of the degassing step,

Mw and Psat(T) are, respectively, the molecular weight and the hydrocarbon saturated vapour pressure above liquid at the temperature T, of the critical hydrocarbon component,

Ptot is the pressure measured above the powder to be degassed in the degassing column, and

Z is the desired maximum residual hydrocarbon content of the critical component in the degassed polymer powder,

and further wherein the G/P ratio in the degassing step is between 1.25*X and 10*X and the concentration of said critical hydrocarbon component in the purge gas is between 0.1*Y and Y.

In another aspect, there is provided a process for the production of a degassed polymer powder, which process comprises

a) feeding;

i) a principal monomer, and

ii) one or more comonomers fed in an amount of at least 5000 parts per million by weight (ppmw) relative to the principal monomer feed rate, and

iii) optionally one or more added alkanes having 2 to 10 carbon atoms, fed in an amount of at least 1000 parts per million by weight (ppmw) relative to the principal monomer feed rate;

into a polymerisation reactor wherein the monomer and comonomers react to form a polymer comprising residual hydrocarbons comprising one or more hydrocarbons having 3 to 10 carbon atoms

b) passing the polymer to a first degassing step wherein, at a temperature, T_1 in range 50 to 110°C, it is contacted with a first purge gas to remove at least some of the residual hydrocarbons as a first gaseous phase and give a polymer with a reduced content of residual hydrocarbon, which is passed to a second degassing step,

c) in a second degassing step, at a temperature, T_2, in the range 50 to 110°C, contacting the polymer removed from the first degassing step with a second purge gas to produce a degassed polymer powder with a concentration of critical hydrocarbon component less than Z_f ppmw and a second gaseous phase,

characterised in that:

1)the first gaseous phase from the first degassing step is treated to remove hydrocarbons having greater than 3 carbon atoms and leave a third gaseous phase comprising predominantly inert gas and hydrocarbons having 3 or less carbon atoms, at least a portion of which is recycled to the first degassing step as at least a portion of the first purge gas,

2) the G/P ratio in the first degassing step is greater than the G/P ratio in the second degassing step, and is between $1.25*X_1$ and $10*X_1$ where:

$X_1 = 28/Mw/100*$ Kh * Ptot1 / $Psat(T_1)$,

3)the concentration of the critical hydrocarbon component in parts per million by weight in the first purge gas is less than Y_1, where:

$Y_1 = 100*(Psat(T_1)/Ptot1/Kh) * 2000$, and

4)the second purge gas is an inert gas and/or the concentration of the critical hydrocarbon component in parts per million by volume in the second purge gas is less than Y_2, where $Y_2 = 100*(Psat(T_2)/Ptot2/Kh) * Z_f$,

wherein:

G is the purge gas mass flow rate in the respective degassing step,

P is the polymer throughput in the respective degassing step,

Kh is the absorption coefficient for the polymer powder to be degassed,

the "critical hydrocarbon component" being the heaviest hydrocarbon component selected from (i), (ii) and (iii) fed in step (a),

Mw, $Psat(T_1)$ and $Psat(T_2)$ are, respectively, the molecular weight, the hydrocarbon saturated vapour pressure above liquid at the temperature T_1, and the hydrocarbon saturated vapour pressure above liquid at the temperature T_2, all being of the critical hydrocarbon component, and

Ptot1 and Ptot2 are, respectively, the total pressures in the first and second degassing steps,

and with the proviso that where the critical hydrocarbon component has 6 or more carbon atoms, but there is also fed to the reaction of step (a) one or more components selected from (ii) and (iii) having 4 or 5 carbon atoms, then the second degassing step is operated such that

I. the degassed polymer powder also has a concentration of the heaviest hydrocarbon component selected from the one or more components selected from (ii) and (iii) in step (a) having 4 or 5 carbon atoms of less than zf ppmw, and

II. the second purge gas is fresh inert gas or the concentration of the heaviest hydrocarbon component selected from the one or more components selected from (ii) and (iii) in step (a) having 4 or 5 carbon atoms in the second purge gas is less than y2, where

$$y2 = 100*(psat(T_2)/Ptot2/Kh) * zf,$$

where $psat(T_2)$ is the hydrocarbon saturated vapour pressure above liquid at the temperature T_2, of the heaviest hydrocarbon component selected from the one or more components selected from (ii) and (iii) in step (a) having 4 or 5 carbon atoms.

DETAILED DISCLOSURE OF EMBODIMENTS

Thus, in a first aspect, the present invention provides a process for the production of a degassed polymer powder, which process comprises:

a) feeding;

i) a principal monomer, and

ii) one or more comonomers fed in an amount of at least 5000 parts per million by weight (ppmw) relative to the principal monomer feed rate, and

iii) optionally one or more added alkanes having 2 to 10 carbon atoms, fed in an amount of at least 1000 parts per million by weight (ppmw) relative to the principal monomer feed rate;

into a polymerisation reactor wherein the monomer and comonomers react to form a polymer comprising residual hydrocarbons comprising one or more hydrocarbons having 3 to 10 carbon atoms, and

b) passing the polymer to a degassing step wherein it is contacted with a purge gas to remove at least some of the residual hydrocarbons,

characterised in that:

1) the G/P ratio in the degassing step is higher than a minimum G/P ratio, G being the purge gas mass flow rate in the degassing step and P being the polymer throughput of the degassing step, and

2) the purge gas has a concentration of critical hydrocarbon component which is lower than a maximum concentration of said critical hydrocarbon component in the purge gas, the critical hydrocarbon component being the heaviest hydrocarbon component selected from (i), (ii) and (iii) fed in step (a);

which minimum G/P ratio and maximum concentration of said critical hydrocarbon component in the purge gas have been calculated based on the absorption coefficient, Kh, for the polymer powder to be degassed.

Kh is the absorption coefficient for the polymer powder to be degassed. Kh is an experimentally derived parameter based on the relationship between vapour partial pressure and absorbed hydrocarbon concentration on a polymer powder. The value of Kh may be measured experimentally for a particular polymer powder by exposing a sample of a polymer powder at constant temperature, T, e.g. 80°C, and a measured pressure to a