The particles formed are dried in air and activated in an oxygen-containing atmosphere. The activated catalyst intermediate is reduced with an organic aluminum compound.

[010] Durand et al., in U.S. Pat. No. 5,075,395, teach a process for elimination of the induction period in the polymerization of ethylene. The polymerization is conducted with a charge powder in the presence of a catalyst comprising a chromium oxide compound associated with a granular support and activated by thermal treatment, this catalyst being used in the form of a prepolymer. The Durand process is characterized in that the charge powder employed is previously subjected to a treatment by contacting the charge powder with an organoaluminum compound in such a way that the polymerization starts up immediately after the contacting of the ethylene with the charge powder in the presence of the prepolymer.

[011] The above described chromium-based catalysts may be used to produce select grades of polymers. Very often, polymerization reactors are required to produce a broad range of products, having flow indices that may vary from 0.1 dg/min to about 100 dg/min, for example. The flow index response of a chromium-based catalyst refers to the range of the flow index of the polymer made by the catalyst under a given set of polymerization conditions.

SUMMARY

[012] An embodiment relates to a method of preparing a chromium-based catalyst for the polymerization of an olefin into a polyolefin, the method including: feeding a chromium-based catalyst to a mix vessel; introducing a stream comprising a reducing agent into the mix vessel through a conduit extending into a nozzle of the mix vessel; and agitating a mixture of the chromium-based catalyst, the reducing agent, and a solvent in the mix vessel to promote contact of the reducing agent with the chromium-based catalyst to give a reduced chromium-based catalyst.

[013] Another embodiment relates to a method of treating a chromium-based catalyst for polyolefin production, the method including: adding a charge of chromium-based catalyst to a mix vessel; introducing a reducing agent into the mix vessel through a conduit extension that extends at least 0.5 inch into the mix vessel and terminates in a designated vapor space of the mix vessel; and agitating a mixture of the chromium-based catalyst, reducing agent, and a solvent in the mix vessel to disperse the reducing agent in the mixture to promote reaction of the reducing agent with the chromium-based catalyst to give a reduced chromium-based catalyst.

[013a] In one aspect, there is provided a method of treating a chromium-based catalyst for polyolefin production, the method comprising:

adding a charge of chromium-based catalyst to a mix vessel;

introducing a reducing agent into the mix vessel through a conduit extension that extends at least 0.5 inch into an upper inside surface of the mix vessel and terminates in a designated vapor space of the mix vessel; and

agitating a mixture of the chromium-based catalyst, reducing agent, and a solvent in the mix vessel to disperse the reducing agent in the mixture to promote reaction of the reducing agent with the chromium-based catalyst to give a reduced chromium-based catalyst.

[014] Yet another embodiment relates to a reducing system for chromium-based catalyst, including: a catalyst feed system to provide a chromium-based catalyst to a mix vessel; a

CLAIMS

What is claimed is:

1. A method of treating a chromium-based catalyst for polyolefin production, the method comprising:

adding a charge of chromium-based catalyst to a mix vessel;

introducing a reducing agent into the mix vessel through a conduit extension that extends at least 0.5 inch into an upper inside surface of the mix vessel and terminates in a designated vapor space of the mix vessel; and

agitating a mixture of the chromium-based catalyst, reducing agent, and a solvent in the mix vessel to disperse the reducing agent in the mixture to promote reaction of the reducing agent with the chromium-based catalyst to give a reduced chromium-based catalyst.

2. The method of claim 1, wherein the conduit extension is an insert through a nozzle on an upper portion of the mix vessel.

3. The method of claim 1, wherein the conduit extension directs the reducing agent toward a surface of the mixture level in the mix vessel.

4. The method of claim 1, wherein the conduit extension directs the reducing agent toward a location of the mixture level in a range of 20% to 80% of a perpendicular distance from a vertical centerline of the mix vessel to an inside surface of a wall of the mix vessel.

5. The method of claim 1, wherein the chromium-based catalyst comprises an activated chromium-based catalyst on an unmilled support, and wherein the reducing agent comprises an organoaluminum compound.

6. The method of claim 1, comprising polymerizing an olefin into a polyolefin in presence of the reduced chromium-based catalyst in a polymerization reactor.

7. The method of claim 1, wherein the chromium-based catalyst comprises an inorganic oxide support having a pore volume of about 0.5 to about 6.0 cubic centimeters (cm^3)/gram (g) and a surface area of about 200 to about 600 square meters (m^2)/g.

8. The method of claim 1, comprising maintaining a level of the mixture in the mix vessel at an impeller region of a shaft of an agitator of the mix vessel.