CLAIMS

What is claimed is:

1. A method of preparing a chromium-based catalyst for the polymerization of an olefin into a polyolefin, the method comprising:

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, wherein the nozzle is on an upper portion of the mix vessel and the conduit terminates in a vapor space 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.

2. The method of claim 1, wherein the conduit extends through the nozzle into the mix vessel past an interior surface of the mix vessel.

3. The method of claim 1, wherein the conduit extends through the nozzle on an upper portion of the mix vessel and directs the stream comprising the reducing agent to a surface of the mixture in the mix vessel.

4. The method of claim 1, wherein the conduit extends through the nozzle on a top head of the mix vessel.

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

6. The method of claim 1, wherein the conduit extending into the nozzle of the mix vessel extends into the mix vessel and comprises a distributor or spray nozzle, or both.

7. The method of claim 1, wherein the conduit extending into the nozzle of the mix vessel extends into at least the nozzle of the mix vessel and is configured to direct a jet of the reducing agent to penetrate to below a surface of a level of a mixture in the mix vessel to facilitate mixing of the mixture in the mix vessel.

8. The method of claim 1, comprising introducing reducing agent to the mix vessel through a second nozzle on a bottom portion of the mix vessel.

9. The method of claim 1, comprising maintaining a level of the mixture in the mix vessel below a top impeller of an agitator of the mix vessel.

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