it would be desirous to provide a process for catalyst separation using a stacked disc centrifuge.

SUMMARY

The present disclosure is directed to a process of separating a catalyst from mother liquor using a stacked disc centrifuge equipped with an auto-discharging functionality. The stacked disc centrifuge is capable of discharging isolated solids at well-defined intervals in a short time span (e.g., 0.1 s to 10 s) thereby avoiding manual catalyst retrieval and centrifuge cleaning. In one example, a stacked disc centrifuge is used to separate a catalyst present in a slurry (e.g., a double metal cyanide [DMC] slurry) by providing the necessary centrifugal force (e.g., from 8,000 G to 15,000 G) and having an auto-discharging function. The stacked disc centrifuge is successfully used at the pilot scale and can be easily scaled up to production scales. The resultant centrate produced from the centrifugation using a stacked disc centrifuge is visibly clear with a total suspended solids content of < 0.2 wt %. The entire amount of slurry can be processed without opening the centrifuge bowl of the stacked disc centrifuge, thereby enabling a substantially continuous operation.

In a first aspect of the present disclosure, there is provided a process for separating a fine catalyst component from a catalyst-containing slurry by separating the catalyst component from the mother liquor of the catalyst-containing slurry, the process comprising:

(a) providing a stacked disc centrifuge equipped with an auto-discharging functionality;

(b) providing a catalyst-containing slurry comprising a mixture of: (i) at least one catalyst compound that is a double metal cyanide; and (ii) at least one liquid component;

(c) feeding the catalyst-containing slurry to the stacked disc centrifuge of step (a);

(d) centrifuging, for a predetermined period of time, the catalyst-containing slurry to form a cake material of catalyst solids in the centrifuge and a centrate; wherein the centrate is removed substantially continuously from the centrifuge during this centrifuging step (d) and the catalyst solids content in the cake material is from 10 weight percent to 40 weight percent; and

(e) removing the cake material from the centrifuge after the centrifugation of step (d).

The present disclosure is also directed to a process of separating fine catalyst particles (e.g., < 5 μm size particles) from a slurry using a stacked disc centrifuge and then washing fine catalyst particles. In this example, the process includes the step of injecting a small quantity (e.g., < 0.5 L to 1 L) of a washing liquid into the centrifuge to make the cake easier to be discharged. It is well known that catalyst solids remaining in a centrifuge, after centrifugation, are mixed with residue liquid and form a thick paste which is difficult to flow and be discharged from the centrifuge. The present disclosure process beneficially improves the ability of the thick paste to be discharged from the centrifuge.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic a perspective view of a stacked disc centrifuge.

Figure 2 is a cross-sectional view taken along line 2-2 of Figure 1.

Figure 3 is a schematic flow chart of the process of the present invention.

WHAT IS CLAIMED IS:

1. A process for separating a fine catalyst component from a catalyst-containing slurry by separating the catalyst component from the mother liquor of the catalyst-containing slurry, the process comprising:

(a) providing a stacked disc centrifuge equipped with an auto-discharging functionality;

(b) providing a catalyst-containing slurry comprising a mixture of: (i) at least one catalyst compound; and (ii) at least one liquid component;

(c) feeding the catalyst-containing slurry to the stacked disc centrifuge of step (a);

(d) centrifuging, for a predetermined period of time, the catalyst-containing slurry to form a cake material of catalyst solids in the centrifuge and a centrate; wherein the centrate is removed substantially continuously from the centrifuge during this centrifuging step (d); and

(e) removing the cake material from the centrifuge after the centrifugation of step (d).

2. The process of claim 1, further including:

(f) washing the cake material of step (e) with a wash solution simultaneously during the step (e) of removing the cake material from the centrifuge to remove any undesired components from the cake material.

3. The process of claim 1, wherein the at least one liquid component is water.

4. The process of claim 1, wherein the at least one catalyst compound is double metal cyanide.

5. The process of claim 2, wherein the washing step of step (f) is carried out using water, butanol, polyether polyol or mixtures thereof as the wash solution.

6. The process of claim 1, wherein the catalyst solids content in the cake material is from 10 weight percent to 40 weight percent.

7. The process of claim 1, wherein the feeding rate of the catalyst-containing slurry to the centrifuge is from 0.001 liters per hour to 300 liters per hour.

8. The process of claim 1, including further operating the centrifuge at a centrifugal force of from 6,000 G-force to 14,000 G-force.

9. The process of claim 1, including further discharging isolated solids from the centrifuge at predetermined intervals in a time period of from 5 minutes to 60 minutes.

10. The process of claim 1, wherein the resultant centrate produced from the centrifugation has

a total suspended solids loss of from 0.005 weight percent to 0.2 weight percent.

11. The process of claim 1, further including:

(g) injecting a washing liquid into the centrifuge after the centrifugation step (d) and prior to removing step (e).