

ABSTRACT

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PROCESS

A continuous process is described for the production of 1,4-cyclohexanedimethanol having a desired or predetermined trans:-cis- isomer ratio by catalytic hydrogenation of a dialkyl 1,4-cyclohexane-dicarboxylate in the presence of an ester hydrogenation catalyst, which process is capable of being operated for an extended period of time during which the hydrogenation catalyst declines in catalytic activity, said process comprising:

- (a) providing a hydrogenation zone containing a charge of a granular hydrogenation catalyst capable of catalysing the hydrogenation of esters;
- (b) determining a Reference Activity (RA) of the granular hydrogenation catalyst by measuring the extent of conversion of the dialkyl 1,4-cyclohexanedicarboxylate to 1,4-cyclohexanedimethanol in passage of a reaction mixture comprising the dialkyl 1,4-cyclohexanedicarboxylate and a hydrogen-containing gas through the granular hydrogenation catalyst at a preselected feed temperature, feed pressure, dialkyl 1,4-cyclohexanedicarboxylate feed rate, and hydrogen-containing gas:dialkyl 1,4-cyclohexanedicarboxylate molar ratio;
- (c) determining an Effective Residence Time (ERT) for contact of the reaction mixture at the preselected feed temperature and feed pressure with the granular hydrogenation catalyst at the reference activity thereof which produces 1,4-cyclohexanedimethanol having the desired trans:-cis- isomer ratio;

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- (d) forming a vaporous feed stream comprising the dialkyl 1,4-cyclohexanedicarboxylate and a hydrogen-containing gas having a preselected hydrogen-containing gas:dialkyl 1,4-cyclohexanedicarboxylate molar ratio;
- (e) feeding the vaporous feed stream to the hydrogenation zone at a substantially constant temperature of from about 150°C to about 350°C and which is above the dew point of the feed stream and at a substantially constant pressure in the range of from about 150 psia (about 10.34 bar) to about 2000 psia (about 137.90 bar) at a rate which corresponds to an Actual Residence Time (ART) of the feed stream in contact with the catalyst which yields 1,4-cyclohexanedimethanol of the desired trans:-cis- isomer ratio;
- (f) recovering from the hydrogenation zone a product stream containing 1,4-cyclohexanedimethanol;
- (g) monitoring the Actual Activity (AA) of the granular hydrogenation catalyst with passage of time by measuring the extent of conversion of the dialkyl 1,4-cyclohexanedicarboxylate to 1,4-cyclohexanedimethanol under the actual operating conditions of feed temperature, feed pressure, dialkyl 1,4-cyclohexanedicarboxylate feed rate, and hydrogen-containing gas:dialkyl 1,4-cyclohexanedicarboxylate molar ratio; and
- (h) adjusting at least one feed condition of the vaporous feed stream to the hydrogenation zone selected from
- (i) the dialkyl 1,4-cyclohexanedicarboxylate feed rate and
- (ii) the hydrogen-containing gas:dialkyl 1,4-cyclohexanedicarboxylate molar ratio while maintaining the feed stream above its dew point to provide an Actual Residence Time (ART) of the vaporous feed stream in contact with the catalyst which corresponds to the Effective Residence Time (ERT) required to provide 1,4-cyclohexanedimethanol having the desired trans:-cis- isomer ratio in accordance with the



relationship:

$$\text{ART} = \frac{\text{ERT} \times \text{RA}}{\text{AA.}}$$

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