providing a novel process for preparing CDON which reduces the proportion of CDEN in the CDON end product and increases the yield of CDON. In addition, the preparation process was to appear more economically viable overall.

Accordingly, a novel process for preparing CDON comprising the steps a and b cited at the outset has been found, which is referred to hereinafter as reaction route I. The CDEN is separated from the CDON-containing mixture and sent to the epoxidation to CDAN epoxide (step a).

In an aspect, there is provided a process for preparing cyclododecanone (CDON) by a reaction route I, comprising

a. epoxidizing cyclododecene (CDEN) to epoxycyclododecane (CDAN epoxide), and

b. rearranging the CDAN epoxide to CDON to obtain a mixture comprising said CDON and CDEN, wherein:

CDEN is separated from the CDON-containing mixture and sent to the epoxidation to CDAN epoxide in step a;

the CDAN epoxide from step a comprises cyclododecane (CDAN) which is at least partly removed prior to the rearrangement in step b; and

the CDAN removed prior to the rearrangement in step b is sent to a reaction route II for preparation of CDON, comprising:

c. hydrogenation of cyclododecatriene (CDT) to CDAN,

d. oxidation of CDAN to give a mixture comprising cyclododecanol (CDOL) and CDON and

e. dehydrogenation of CDOL to CDON.

In another aspect, there is provided a process for synthesizing laurolactam from CDON, wherein the CDON is prepared as defined herein.

In another aspect, there is provided a process for preparing nylon-12 from CDON, wherein the CDON is prepared as defined herein.

The CDON process of the present disclosure can be conducted continuously or batchwise.

The rearrangement is preferably conducted at a maximum hydrogen pressure of 0.9 bar. Preferably, the hydrogen pressure is 0 to 0.9 bar, more preferably 0 to 0.5 bar. The process according to the invention can be conducted without hydrogen, but it is preferable to initially charge at least a small hydrogen content to prevent unsaturated by-products. This hydrogen content may be 0.05 to 0.5 bar, preferably 0.1 to 0.4 bar.

The pressure figures given above relate to the partial pressure of hydrogen in the system. Typically, components of the reaction mixture including the solvent, air or inert gases such as nitrogen or argon are further gaseous constituents of the system.

A rearrangement in the context of the CDON process of the invention is especially understood to mean a reaction in which at least 90% by weight of CDON, based on the total weight of CDON and CDOL formed, is obtained.

Preferably, the CDEN for the epoxidation (step a) is obtained from CDT. The CDT in turn can be obtained from 1,3-butadiene. The selective hydrogenation of CDT can be effected in the gas phase with a low partial pressure of hydrogen and a Pd-containing catalyst (EP 1457476). The step typically gives rise to 5% to 15% by weight of CDAN (cyclododecane) in CDEN.

Claims

1. A process for preparing cyclododecanone (CDON) by a reaction route I, comprising

a. epoxidizing cyclododecene (CDEN) to epoxycyclododecane (CDAN epoxide), and

b. rearranging the CDAN epoxide to CDON to obtain a mixture comprising said CDON and CDEN,

wherein:

CDEN is separated from the CDON-containing mixture and sent to the epoxidation to CDAN epoxide in step a;

the CDAN epoxide from step a comprises cyclododecane (CDAN) which is at least partly removed prior to the rearrangement in step b; and

the CDAN removed prior to the rearrangement in step b is sent to a reaction route II for preparation of CDON, comprising:

c. hydrogenation of cyclododecatriene (CDT) to CDAN,

d. oxidation of CDAN to give a mixture comprising cyclododecanol (CDOL) and CDON and

e. dehydrogenation of CDOL to CDON.

2. The process according to claim 1, wherein CDEN for the epoxidation in step a is obtained from cyclododecatriene (CDT).

3. The process according to claim 1, wherein the rearrangement in step b is effected in the presence of a noble metal catalyst.

4. The process according to claim 3, wherein the catalyst for the rearrangement (step b) comprises titanium dioxide, zirconium dioxide or both.

5. The process according to claim 1, wherein the CDAN epoxide from step a comprises CDEN which is at least partly removed prior to the rearrangement in step b.

6. The process according to claim 1, wherein the CDON-containing mixture comprises cyclododecanol (CDOL) which is dehydrogenated to CDON.

7. The process according to claim 6, wherein the CDOL is separated from the CDON-containing mixture prior to the dehydrogenation and is sent to the reaction route II for preparation of CDON.

8. The process according to claim 1, wherein at least one removal of any compound is conducted by distillation.

9. The process according to claim 1, wherein all removals of any compound are conducted by distillation.

10. The process according to claim 1, wherein CDT is obtained from 1,3-butadiene.

11. A process for synthesizing laurolactam from CDON, wherein the CDON is prepared according to claim 1.

12. The process according to claim 11, wherein the CDON is converted to cyclododecanone oxime (CDON oxime).

13. A process for preparing nylon-12 from CDON, wherein the CDON is prepared according to claim 1.