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Description

Process for the preparation of 1,1,1,2,3,3,3-heptafluoropropane (R 227)

The invention relates to a process for the preparation of 1,1,1,2,3,3,3-heptafluoropropane (R 227) by hydrodechlorination of 2-chloroheptafluoropropane on a catalyst. R 227 can be employed as a propellant gas and in air-conditioning equipment.

The preparation of R 227 from hexafluoropropene and hydrogen fluoride with the aid of an activated charcoal catalyst has already been disclosed (British Patent 902,590). However, the product contains unsaturated, toxic compounds, for example unreacted hexafluoropropene.

The present invention relates to a process for the preparation of 1,1,1,2,3,3,3-heptafluoropropane, which comprises reacting 2-chloroheptafluoropropane with hydrogen in a molar ratio of from 1:1 to 1:10 in the gas phase on a palladium-, platinum-, ruthenium-, rhodium-, nickel- or copper-containing supported catalyst at temperatures of from 100 to 400°C and pressures of from 1 to 50 bar.

Examples of suitable support materials are activated charcoal, lithium-aluminum-spinel and aluminum oxide; activated charcoal is preferred.

The Pd, Pt, Ru, Rh, Ni or Cu content of the supported catalyst is generally from 0.2 to 5 % by weight, based on the total weight of the catalyst. Palladium is preferred.

The reaction temperature is preferably from 200 to 300°C; the preferred pressure range is from 1 to 5 bar.

From 1 to 10 mol of hydrogen, preferably from 1 to 3 mol of hydrogen, are employed per mole of 2-chloroheptafluoropropane.

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Since the process according to the invention is a hydrodechlorination under hydrogenation conditions, no unsaturated compounds, in particular no toxic compounds, are formed, in contrast to the known process of British Patent 902,530.

The preparation of the 2-chloroheptafluoropropane employed as starting material is described in Chemical Abstracts (C91-081033).

The gas mixture produced is washed with water, deacidified and condensed. GC analysis shows the composition of the crude gas obtained in this way.

Example

A vertical, electrically heated, tubular steel reactor (length = 100 cm, diameter = 2 cm) was charged with 200 ml of activated charcoal doped with 0.7 % by weight of palladium.

The catalyst was conditioned for 6 hours at 250°C while 5 l of hydrogen were passed through the catalyst per hour. 0.4 mol/h of CF_3-CClF-CF_3 and 1 mol/h of hydrogen were then metered in at 250°C at atmospheric pressure. The reaction gases leaving the reactor passed through a water scrubber with subsequent drying and condensation at -15°C.

Conversion: 89 %

Selectivity: 85 %

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Patent Claims:

1. A process for the preparation of 1,1,1,2,3,3,3-heptafluoropropane, which comprises reacting 2-chloroheptafluoropropane with hydrogen in a molar ratio of from 1:1 to 1:10 in the gas phase on a palladium-, platinum-, ruthenium-, rhodium-, nickel- or copper-containing supported catalyst at temperatures of from 100 to 400°C and pressures of from 1 to 50 bar.

2. The process as claimed in claim 1, wherein the Pd, Pt, Ru, Rh, Ni or Cu content of the supported catalyst is from 0.2 to 5 % by weight.

3. The process as claimed in claim 1 or 2, wherein a palladium-containing supported catalyst is employed.

4. The process as claimed in any of claims 1 to 3, wherein from 1 to 3 mol of hydrogen are employed per mole of 2-chloroheptafluoropropane.

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Abstract of the disclosure:

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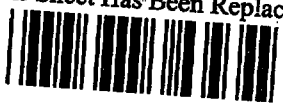

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REPLACEMENT SHEET
05 MAR 1997

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05 MAR 1997

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REPLACEMENT SHEET
13 AUG 1999

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2. The process as claimed in claim 1, wherein the Pd, content of the supported catalyst is from 0.2 to 5 % by weight.