Technology Offer by

Hessische Intellectual Property Organisation

Direct oxidation with oxygen - Aldehydes and ketones without by-products

Oxidation, aldehydes / ketones, cyclohexanone, chemistry, synthesis

DESCRIPTION OF TECHNOLOGY / PRODUCT

In many industrial oxidation reactions, in particular the production of aldehydes and ketones by direct oxidation, there is the problem that the known oxidizing agents either have a very non-selective effect or they are very expensive and are therefore unsuitable for large-scale use.

With the new combination catalyst, it is possible for the first time to achieve a very selective and thus by-product-free oxidation of alkanes / cycloalkanes to aldehydes or ketones using molecular oxygen as the oxidizing agent.
The combination catalyst / catalyst system consists of two metal complex compounds which are suitably used simultaneously and thereby catalyze the oxidation of organic substrates with oxygen together.
The mechanism in this case, with its multistage nature, has certain similarities to natural oxidation processes, which are also known to be often multi-stage.
Due to the selectivity of the reaction, only minimal purification is necessary to obtain a product which can be reused or sold.
The required reaction conditions are very mild (example: oxidation of cyclohexanone to cyclohexanone - reaction time of 30 minutes at room temperature in MeOH).

AT A GLANCE …

TECHNOLOGY FIELD / SCOPE OF APPLICATION

- Organic synthesis
- Oxidation
- Preparation of aldehydes / ketones

MARKET / BRANCH

- Chemical industry
  - Basic chemicals
  - Specialty chemicals/Custom synthesis

USP

- Selective oxidation to Aldehydes/ Ketones
- Cost-effective oxidizing agent

DEVELOPMENT STATUS

✓ The feasibility was demonstrated by laboratory tests

➢ Next steps: Material screening for further suitable catalyst combinations as well as high scaling

PATENT PORTFOLIO

Priority application filed in February 2017

REFERENCE NO.: TM 948

SCOPE OF APPLICATION

The new inexpensive and effective oxidation process presented can advantageously be applied in the field of industrial organic synthesis. In addition to the primarily favored application for the preparation of basic chemicals required in large quantities (for example, cyclohexanone for the production of e-caprolactam and ultimately polyamide-6), the process can also be used profitably as an oxidation step in more extensive syntheses sequences. In addition to the large-scale industry, the process is therefore also interesting for producers of special chemicals.

ADVANTAGES COMPARED TO STATE OF THE ART

The catalyst system makes it possible to carry out extremely selective oxidations to give aldehydes or ketones with the most inexpensive of all oxidizing agents - air oxygen. This provides an enormous cost reduction potential for the manufacturing chemical industry.

DEVELOPMENT STATUS

The basic method principle has been demonstrated in laboratory scale on the basis of several test series by GC-MS analysis of the product solutions obtained. Further research results are available on request.

MARKET POTENTIAL

Oxidation reactions are extremely important, basic processes of the chemical industry in many areas. The method developed now offers an enormous cost reduction potential and is of great relevance, both, for companies that manufacture mass products as well as for smaller specialty chemicals manufacturers. The market potential can therefore be assessed very positively.

OFFER

On behalf of its shareholder Justus-Liebig-University Giessen, TransMIT GmbH is looking for cooperation partners or licensees for further development in Germany, Europe, the US and Asia.

A TECHNOLOGY OF

JUSTUS-LIEBIG-UNIVERSITÄT GIESSEN

REFERENCE NO.: TM 948

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