Institut "Jožef Stefan" Ljubljana, Slovenija

TECHNOLOGY OFFER

SILVER SALTS FOR ENERGY-EFFICIENT ORGANIC REACTIONS LIKE ISOMERIZATION, DEHYDROGENATION, CRACKING AND COUPLING

Fields of use
Inorganic and Organic substances, Speciality/performance chemicals, Industrial chemicals, Petrochemistry, Petroleum Engineering, Sludge Treatment / Disposals, Pharmaceuticals, Pollution and Recycling

Current state of technology
Available for demonstration

Type of cooperation
License or technical cooperation agreement

Intellectual property
Patent(s) applied for but not yet granted

Developed by
Jožef Stefan Institute

Contact
Jožef Stefan Institute,
Jamova cesta 39,
1000 Ljubljana,
Slovenija
Phone: + 386 1 47 73 224
E-mail: tehnologije@ijs.si
Web site: http://tehnologije.ijs.si/

Summary
A Slovenian research institute together with a Polish university offers technology for optimisation of organic reactions. This is achieved by innovative preparation of silver salts and hydrates as reagents for organic reactions (isomerization, dehydrogenation, cracking and coupling). The technology is ecological and energy-efficient. Companies from petrochemical, chemical, pharmaceutical and environmental sector are sought for license or technical cooperation agreement.

Description of the invention

Modifications of organic compounds such as isomerization (including cyclization and ring opening), dehydrogenation (including aromatization), cracking (breaking of C-C bonds) and coupling (formation of C-C bonds) are common reactions in chemical and petrochemical industry. These are also important in treating wastes consisting toxic hydrocarbons and their derivatives, or hazardous materials, such as persistent organic pollutants, carcinogenic polyaromatic hydrocarbons, industrial wastes, wastes from nuclear industry, and other.

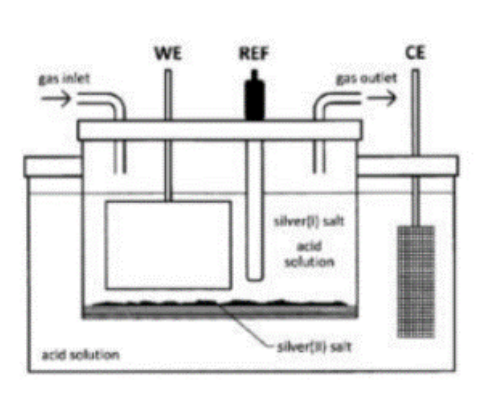
Some of the reactions of major industrial importance are listed below:

- isomerization of light alkanes
- isomerization of light paraffin
- dehydrogenation of propane to propene
- dehydrogenation of aliphatic hydrocarbons
- dehydrogenation of propane
- thermal cracking

Researchers of the Slovenian institute in cooperation with researchers of the Polish university have developed an effective method to modify the molecular structures of organic compounds, including isomerization, dehydrogenation, cracking and coupling of organic compounds in a simple synthesis reaction, which result in breaking and/or the formation of new carbon-carbon bonds. This is accomplished by using silver salts and hydrates, e.g. silver sulphate as reagent, allowing processing of these reactions in the simple one-pot synthesis (i.e., direct one-step synthesis). The research group has developed an effective process for the electrochemical synthesis of the silver salts of high purity. The process of silver salts synthesis is schematically depicted in the attached photo.

KONZORCIJ ZA PRENOS TEHNOLOGIJ IZ JRO V GOSPODARSTVO
EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND
REPUBLIC OF SLOVENIA
MINISTRY OF EDUCATION, SCIENCE AND SPORT
The investment is co-financed by the Republic of Slovenia and the European Union under the European Regional Development Fund.

Institut
"Jožef Stefan"
Ljubljana, Slovenija



The researchers are looking for companies from chemical, petrochemical, pharmaceutical and environmental sector, who are interested in licence or technical cooperation agreement. In the case of licence agreement, the companies are supposed to include the silver salts and hydrates technology in their industrial process. If the company is interested in further development of the technology, researcher partners would enter into technical cooperation agreement with such company.

Main Advantages

The main advantages of the presented method are:

- Organic reactions are energy-efficient: The cross-coupling technic enables reactions to be carried out at room temperature (instead of at elevated temperatures) over a number of organic compounds.
- Organic reactions are simplified: The cross-coupling reactions proceed without first being modified or activated – there is no need for modification or activation of starting materials.
- Silver salts are of very high purity.
- Synthesis of silver salts of the invention allows the reuse of the reduced silver products: This enables cyclic use of this material.
- Synthesis of silver sulphate does not produce any hazardous chemicals.
- Hydrates of the silver salts are water resistant: at the same time they retain all desirable characteristics of silver compounds (i.e., high redox potential, chemical inertness in contact with hydrocarbons, etc.). This is significant advantage, because facilities are able to use the silver salt hydrates as chemicals under normal conditions in an air atmosphere containing moisture.

Partner Sought

Type of partner: Sought are companies from chemical, petrochemical, pharmaceutical and environmental sector.

Role of partner: In the case of license agreement implementation of silver salt technology to the reactions of organic compounds. Cooperation in the industrial sized scale-up of the process and joint development during the pilot phase in the case of technical cooperation agreement.

KONZORCIJ ZA PRENOS TEHNOLOGIJ IZ JRO V GOSPODARSTVO

EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND

REPUBLIC OF SLOVENIA
MINISTRY OF EDUCATION, SCIENCE AND SPORT

The investment is co-financed by the Republic of Slovenia and the European Union under the European Regional Development Fund.