NEW HYBRID CATALYTIC CONVERTERS "ON DEMAND" MORE EFFICIENT AND SUSTAINABLE

PATENTED TECHNOLOGY

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ABSTRACT

The Molecular Nanotechnology Laboratory of the University of Alicante has developed a new hybrid zeolitic material characterized by the fact that the same solid contains, at least, two different zeolites. With this innovative solution, new more efficient and sustainable "ad hoc" catalysts can be developed for different industrial processes, including: chemical (oil cracking), pharmaceutical (increasing the performance of synthesis processes by more than six times), reuse of plastics, waste valorization, etc.

This novel technology improves the performance of chemical reactions, it increases catalytic activity in the transformation of bulky molecules and it allows significant energy savings. The technology has been developed at laboratory level, and it has been successfully validated in different chemical processes with different molecules.

It is looking for companies interested in acquiring this technology for its commercial exploitation through patent license agreements.

ADVANTAGES AND INNOVATIVE ASPECTS

ADVANTAGES OF THE TECHNOLOGY

The design and development of new "on demand" hybrid zeolitic materials has the following **advantages**:

1) The inclusion of mesopores in the zeolitic structure significantly shortens the diffusion path of reagents and products, which it reduces the contact time and it **improves the overall performance** of the material.

2) **Enhanced catalytic activity** in the transformation of bulky molecules.

3) **Improved hydrothermal stability** compared to similar purely amorphous materials.

4) **Very precise control of the size and volume of the pores** in the resulting hybrid material, as well as in the relative amount of the fragments of the different zeolites.

5) **Improved technical performance**: physicochemical properties (stability, acidity, confinement, etc.) can be adjusted specifically to the industrial application of interest.

6) The addition in the structure of other elements than silicon and aluminium allows improving some of its properties, such as acidity, activity or catalytic selectivity, as well as providing the hybrid material with **new functionalities**, such as: redox properties, different hydrophilicity, reactivity and affinity for different molecules.

7) **Higher yields** in the production of **fossil fuels** and in the synthesis of **pharmaceutical compounds** (up to more than six times).

8) The preparation procedure of these materials is **very simple**.

9) The synthesis method used is **sustainable and environmentally friendly**.

10) **Great versatility**: the physicochemical characteristics of the synthesized catalyst can be modified with great precision to suit the needs of each process.

11) The synthesis process **saves energy and natural resources** compared to current conventional zeolite synthesis methods: for example, it is possible to significantly reduce the temperature required to degrade different types of plastics, which it means significant savings in energy and CO_2 emissions.

INNOVATIVE ASPECTS OF THE TECHNOLOGY

A new family of catalysts with "on demand" properties has been developed whose main innovation lies in the fact that they **can be designed with optimized physicochemical features for different industrial processes**.

A novel material has been synthesized that combines the best characteristics of several zeolites. For this purpose, an ingenious and simple procedure has been used to transform zeolites into other more stable. Through precisely controlling this conversion, **the characteristics of several zeolites have been achieved in a single material**, which represents a very promising advance in the field of catalysis.

In this sense, synthesizing catalysts that combine the properties of several zeolites opens up countless opportunities in sectors such as pharmaceuticals, chemicals or the reuse of plastics (*see Images 1 and 2*).

Image 1 and 2: vials with the new catalysts designed at the UA, and sample of plastic transformed into hydrocarbons.

MARKET APPLICATIONS

This technology is part of the field of **materials chemistry**, and it finds its main **applications** in industry:

- Chemical.
- Pharmaceutical.
- Energy.
- Reuse of plastics.
- Waste recovery.
- Elimination of pollutants.
- Ionic exchange.
- Adsorption:
  - Drying.
  - Purification.
  - Separation.
- Catalysis:
  - Catalytic cracking (oil refining).
  - Hydrocracking.
  - Alkylation.
  - Acylation.
  - Isomerization.
  - Oligomerization.
  - Hydrotreating.
  - Biomass transformation.

COLLABORATION SOUGHT

Companies interested in acquiring this technology for **commercial exploitation** through **patent licensing agreements** are sought.

Company profile sought:

- Chemical, pharmaceutical, energy, catalysis, etc.