

## CATALYTIC SYSTEM CONTAINING IONIC LIQUIDS AND A PROCESS FOR PRODUCING HYDROGEN FROM PLASTIC MATERIALS USING SAID CATALYTIC SYSTEM

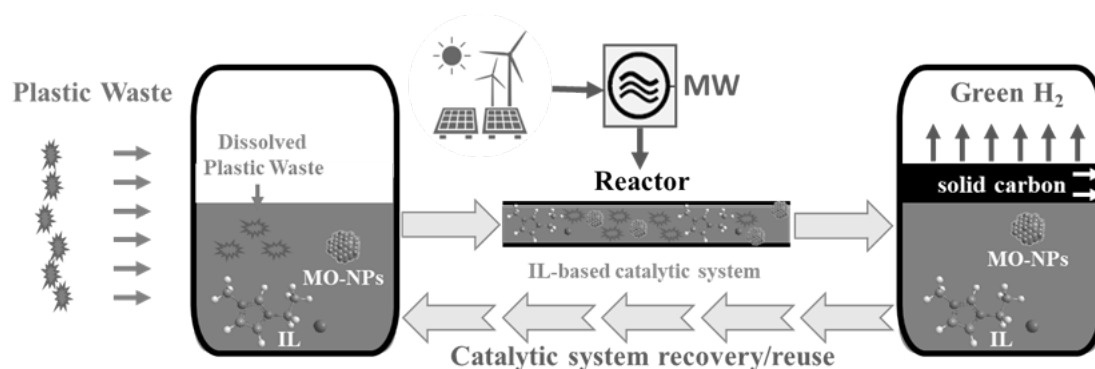
**PATENT NUMBER:** WO2023242335A2

**INVENTORS:** Eduardo J. Garcia-Suarez (CIC energigUNE), Stefania Doppiu (CIC energigUNE), Francesco Torre (CIC energigUNE), Elena Palomo del Barrio (CIC energigUNE), Jonatan Pérez Arce (CIC energigUNE)

The authors of the present invention have developed an ionic liquid-based catalytic system to be used in plastic waste mitigation through its transformation into decarbonized products such as clean hydrogen and added value carbon materials. These novel ionic liquid-based catalytic systems aim to overcome so far, the main drawbacks of the already existing technologies by diminishing significantly the total amount of catalyst needed, avoiding catalyst deactivation by coking phenomena, facilitating the recovery of solid decarbonized materials co-products, and allowing the recovery and reuse of the entire catalytic system.

The key factor of the present invention is the presence of the ionic liquids in the “so called” ionic liquid-based catalytic system. Most of the ionic liquids have shown to be thermally stable, to stabilize metal nanoparticles (avoiding their agglomeration), to have a good plastic solubility, good chemical stability towards the metal catalyst and H<sub>2</sub>, and low carbon wettability.

The ionic liquid-based catalytic system, which also includes metal oxides, enables a rapid and efficient production of clean hydrogen, along with a valuable carbon material, as the sole products, from plastic waste, mainly from plastic having a low recyclability rate, such as PE, PP and PS. This system has resulted to be particularly useful in plastic waste catalytic cracking under electromagnetic irradiation, mainly under microwave irradiation.



*Schematic representation of the plastic waste catalytic cracking process by using our novel ionic liquid-based catalytic system*

**ADDED VALUE**

*Making sustainability real*

- ✓ Low amount of catalyst needed.
- ✓ Facile recovery of solid decarbonized co-products.
- ✓ Easy recovery and reuse of the ionic liquid-based catalytic system.
- ✓ Rapid and efficient production of clean hydrogen.
- ✓ Metal nanoparticles stabilization.
- ✓ Avoids or diminish significantly coking phenomena.
- ✓ Low energy consumption (less than conventional heating).
- ✓ Added-valued carbon materials production.

## APPLICATION OF THE TECHNOLOGY

- ✓ Plastic waste chemical recycling
- ✓ Clean hydrogen production
- ✓ Carbon materials user sectors (energy, aerospace, automotive, electronics, etc.).

## LICENSING CONTACT

Business Development Manager

[businessdev@cicenergigune.com](mailto:businessdev@cicenergigune.com)

T: +34 945 297108