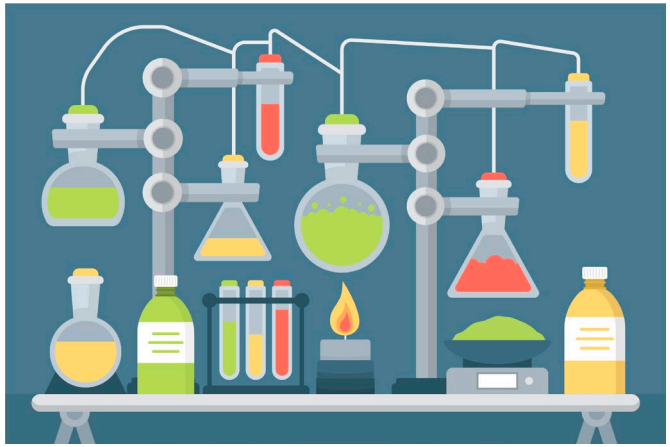
Technology Offer CSIC/AF/020

Photocatalityc oxidation process to produce phenol



New photocatalytic process to produce phenol and other alcohols from different precursors.

Intellectual Property

Priority patent application filed

Stage of Development

Process validated in Laboratory

Intended Collaboration

Licensing and/or co-development

Contact

Alfonso del Rey

Vice-presidency for Innovation and Transfer

adelrey@icmab.es
comercializacion@csic.es

Market need

Phenol is an industrial commodity as precursor to many materials, such as, epoxies, nylon, detergents, pharmaceutical drugs, etc. Phenol market in 2022 was 23 billion US dollars.

Cumene process is the standard method to obtain phenol and acetone as a by-product, in a proportion 60:40. The process needs high pressure and high temperature in some of the steps.

A greener method is needed.

CSIC solution

Our new method consists of a photoredox reaction in water, catalysed by metallacarboranes at room temperature and atmosphere pressure. We can obtain phenol with an over 90% yield. Increasing the time of the reaction we can obtain other products as pyrocatechol, resorcinol, among others. This photocatalytic process can be used to obtain other alcohols from aliphatic and aromatic hydrocarbons, such as hexane, heptane, cyclohexene, toluene, etc.

Competitive advantages

- Easily scalable and organic solvents free synthesis.
- High yield, no by-products.
- Versatile process that canuse different starting materials to obain different final products.
- “Green and simple process”, wáter, light and oxygen or air.