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Nature, Ecology and Chemistry: an unusual combination as a Green'up driver

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PURPOSE OF THE ABSTRACT

Despite the enforcement of European regulations, the dissemination of metal elements within environment is continuing, even though, the depletion of mineral resources is alarming. The aim of the presented work is the implementation of breakthrough innovations and cross disciplinary research in ecological restoration, material chemistry and green catalysis to overcome this paradox.

This communication will focus on the ecological treatment and recycling of industrial effluents by biosorption, and the ecological restoration of mining sites by phytoextraction. The study deals with two complementary representative cases: polluted effluents from pyrite quarries (Fe/Mn) in Bretagne (France) and contaminated soils by mining operations (Ni/Mn) in New Caledonia.

Based on the ability of some specific plants to concentrate metals into their shoots or roots in extreme environmental conditions, we have addressed the transformation of plant-derived transition metals into green catalysts. These novel polymetallic catalytic materials (Eco-MnNC and Eco-Man) have been used in organic synthesis to generate bio-sourced molecules for future applications.

The polymetallic structure as well as the potential cooperative effects between elements in the ecocatalysts will be presented in order to explain their behavior in chemistry. The activity, selectivity and recyclability of ecocatalysts will be illustrated in reactions traditionally employing oxidants prohibited by REACH regulations.

This work provides the catalytic and ecological tools for tomorrow's chemistry, building on the recycling of transition metals to create scientific and economical value. It offers pioneering solutions to initiate an unprecedented program, where Green Chemistry becomes a Green Revolution.

FIGURES

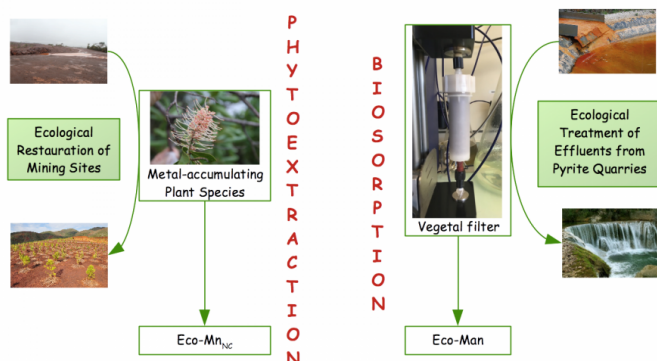


FIGURE 1

Design of eco-friendly processes for transforming contaminated waste into new catalysts

The extraordinary potential of ecocatalysts derived from phytoextraction and biosorption for new green oxidations

FIGURE 2

KEYWORDS

Depollution | Ecological catalysis | Phytotechnologies | Green oxidation

BIBLIOGRAPHY