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From metal to metal free oxidation of biosourced furan derivatives.

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PURPOSE OF THE ABSTRACT

Day by day, catalysis is making our life more sustainable. Nevertheless, how sustainable are catalysts themselves? Dematerializing catalysts, in using less noble and expensive materials to afford the same or better level of functionality, has become a serious challenge for researchers and engineers. According to the Federal Register of the United States on February 2018, 35 metals and metalloids such as platinum metals, rare-earth elements group, cesium, chromium, aluminum, cobalt, titanium and many others have been listed as critical minerals [1]. Remarkably, these metals are familiar catalysts in chemical industries and lately they were widely used in nanomaterial-based catalysts, such as Co, Au, Ni, Pd and Pt, for numerous chemical reactions. This is due to the various advantageous chemical properties, such as high catalytic activity, redox properties, and acid-base sites and physical properties such as porosity, thermal stability, and high surface area. Despite all the valuable properties of nanomaterial-based catalysts, their high cost, deactivation and leakage problems and toxicity remain an important drawback. In this context, the best solution for the future industry of catalysts is to replace when possible metal catalysts by ?metal-free? catalysts. This could establish a new concept or class of catalysis where metals are completely absent. The increasing use of metal-free catalysis in the recent years is not a new trend but their return to grace coincides with the development of industrial interests for more economical, eco-friendly and safer processes.

In this communication we will present our work on the substitution of metal catalysts commonly used for the selective oxidation of biobased furan derivatives, by metal free catalysts or methods without catalyst. These innovative processes demonstrate that it is possible to get rid of rare and expensive metal catalysts by cheap and recyclable organic catalysts. The products obtained are difunctionalized molecules of interest with a strong potential for new markets or are commodity products that can replace their petroleum-based origin, such as diformylfuran, succinic acid or maleic acid.

FIGURES

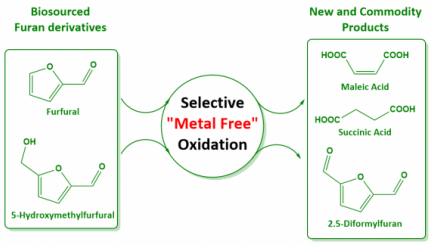

FIGURE 1

metal free oxidation of biosourced furan derivatives

Metal free oxidation of furfural and HMF

FIGURE 2

KEYWORDS

Metal free oxidation | Biosourced furan derivatives | Organic catalysis | Alternative activation

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