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# Outstanding Nickel nanocatalysts: from greenhouse gases to hydrogen

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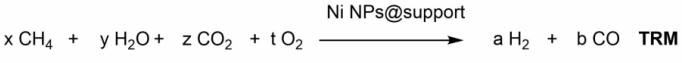
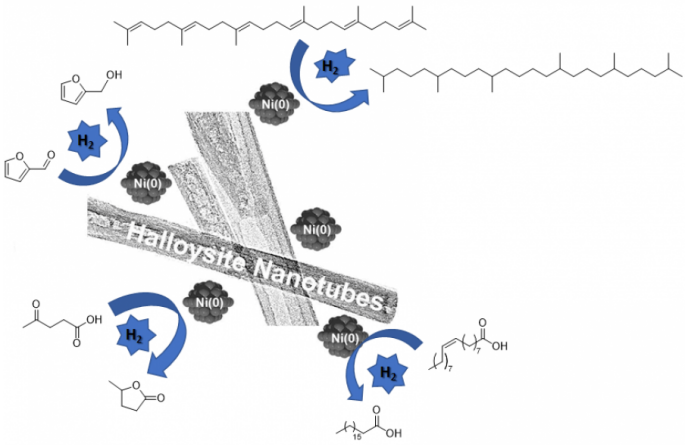
## PURPOSE OF THE ABSTRACT

Syngas (a mixture of CO and H2), is a versatile feedstock that can be used in several industrial processes: methanol and ethanol synthesis, hydrogen production via water-gas-shift, liquid fuels production, etc... Herein we propose a sequential strategy encompassing two catalytic transformations for the sustainable production of amines starting from CO2 and CH4 through the controlled production of syngas (in ratio and yield).
In a first part, we present the tri-reforming of methane (TRM) reaction catalyzed by Ni-based nanoparticles immobilized in inorganic solids (Scheme 1). Different key parameters have been studied to enhance the catalytic performance, such as the nature of the support and the active phase (small nickel nanoparticles, metal-support interaction enhancement ?), with the goal of obtaining high efficient catalysts from abundant resources. Full characterization of the as-prepared catalytic materials will also be shown.In addition, the as-prepared catalytic materials were evaluated towards the hydrogenation of several functional groups such as alkynes, alkenes, aldehydes, ketones, nitriles, nitro groups... Depending on the nature of the support and stabilizer, different catalytic behaviour was found. Actually, nickel nanoparticles immobilized on clays resulted in a versatile and highly efficient catalyst, including substrates coming from biomass wastes such as fatty acids, squalene, furfural and levulinic acid (Scheme 2), leading to high-added value products.

## FIGURES




### FIGURE 1
Scheme 1:
Ni-catalyzed tri-reforming reaction.

### FIGURE 2
Scheme 2
Hydrogenation of biomass substrates towards high value products


## KEYWORDS
Methane Tri-reforming | Supported nickel nanoparticles | Sustainable carbon cycles | Biomass upgrade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