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Editorial

Ni-Containing Catalysts

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Murray Raney used Nickel for the first time as a hydrogenation catalyst over one century ago [1]. Since then, the field of Nickel catalysis has seen tremendous advances. During the 1970s, Nickel found extensive use as a catalyst not only for cross-coupling reactions of alkenes/alkynes, such as nucleophilic allylation, oligomerization, and cyclo-isomerization, etc., but also for C/H activation, oxidative cyclization, and reduction reactions [2–6].

More recently, it has been used in the formulation of catalysts assessing important environmental issues, such as CO_2 chemical utilization, or as a dopant of molybdenum, sulfide-containing catalysts for desulfurization processes [7].

Several key properties of nickel such as its thermal stability and redox behavior mean Nickel-containing catalysts are still challenging for a very large range of innovative reaction developments and industrialization. The purpose of this Special Issue is to update the most recent advances concerning Nickel catalysts, supported or not, for innovative reaction development. This issue consists of 12 articles, 2 review papers and 10 research articles. Nine articles deal with catalytic application, Two are related to synthesis and one focuses on modeling.

The first review deals with the promotion of Ni-based catalysts with Fe for catalytic hydrogenation [8]. It is well known that Ni-based catalysts can be active in hydrogenation; however, the selectivity in desired products can be very poor. Thus, the importance of this promotion is pointed out herein. A second article deals with hydrogenation on Ni-P catalysts. The alumina-supported Ni-P exhibited a high activity in acetophenone hydrogenation and a remarkable selectivity to 1-phenylethanol due to the particle size of the active phase [9].

The second review article is about biomass valorization and more specifically, Lignin valorization using Ni-based catalysts [10]. The authors describe how to design efficient Ni-based catalysts based on lignin conversion reactions. A second article is dedicated to developing natural biomass with high Ni content to establish low-cost biochars with wide-ranging applications in catalyzing the redox-mediated reactions of pollutants, as described by the authors [11].

Two articles are related to pollution control—one dealing with reactive adsorption desulfurization and the second one dealing with NO_x removal. As reported, the first article points out important results on NiO/ZnO-Al_2O_3-SiO_2 catalysts, showing high activity for Reactive adsorption desulfurization (RADS) [12]. In the second one, the authors clearly show the potential of hydrotalcite-derived NiFe mixed oxides for NO_x abatement with a high resistance to SO_2 [13].

Two articles present novelties in methanation applications. The first one on NiMnAl-hydrotalcite-derived mixed oxides presented high performance in syngas methanation at low temperatures. They pointed out the influence of MnO_y and the embedding effect of AlO_x in the catalytic performances [14]. The second one presented the carbon deposition behavior of novel catalyst prepared by combustion method in slurry methanation. The authors pointed out the carbon type formed during the reaction and proposed its removal by oxidative calcination which will not affect the catalyst structure [15].

Two articles are also focused on environmental issues through CO_2 utilization via its hydroboration over novel types of bis(phosphinite) (POCOP) pincer nickel complexes and

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through glycerol steam reforming over promising nickel supported on $AlCeO_3$ leading to hydrogen production [16,17].

Finally, the two last articles dealt with a new synthesis route of Ni-containing catalysts and computational investigation of a nickel-based catalyst. Thus, the authors showed the importance of the study of chemical and morphological transformations during Ni_2Mo_3N synthesis from oxide precursors, the control of the synthesis being a crucial point in order to develop a highly active and selective catalyst [18]. Finally, density functional theory (DFT) methods have been employed to conduct computational investigations on nickel-mediated reactions [19]. These powerful tools are also very important in order to predict or to confirm experimental data.

In conclusion, as presented in this issue, the development of the new supports, the addition of new promoters and the use of Ni-containing catalysts in novel applications make these Ni-containing catalysts promising materials for improving the actual catalytic process and for developing new ones such as assisted catalytic processes using plasma, solar energy or electro-assisted catalysis [20–25].

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