Nanohybrid of Activated Carbon Nanotube-Porphyrin as a Recyclable Catalyst for Aqueous Oxidation of Hydrocarbons with n-Bu_4NHSO_5

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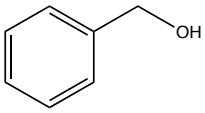
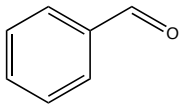
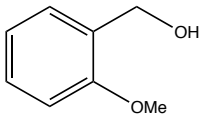
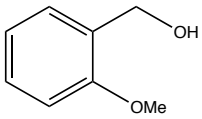
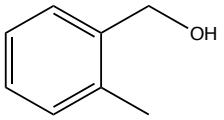
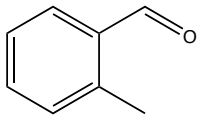
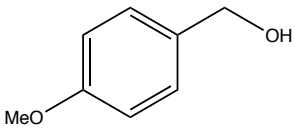
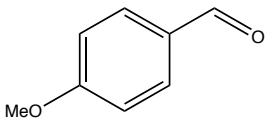
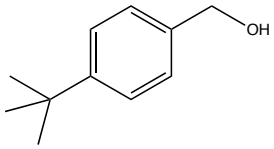
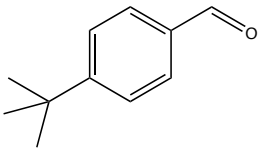
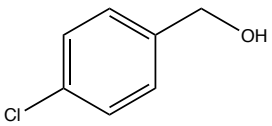
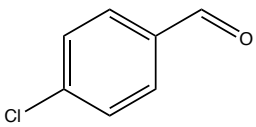
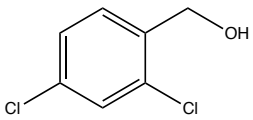
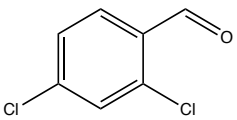
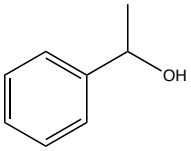
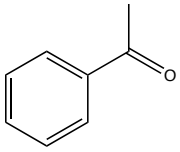
Abstract

Nano-sized functional hybrid materials have become a highly innovative research field. The ability to tailor the organic part combined with the properties of the nano-sized inorganic matrixes is of great interest for potential applications in electronics, optics and catalysis. In particular, an association of a metal complex with a catalytically active inorganic support could provide a catalyst having improved catalytic properties due to the combination of two different catalytic sites in one material [1]. Carbon nanotubes (CNTs), as a new type of carbon material among the solid supports, are cylindrically shaped and have appropriate pore-size distributions favoring maximum metallic dispersion [2]. Their morphology and special and steady structural characteristics are quite suitable for their use as hybrid catalysts, consisting of a metal complex anchored on a solid support, which could be regarded as a novel system able to combine the advantages and to overcome the drawbacks of homogeneous and heterogeneous catalysis [3]. Especially, their surface properties can be modified through various treatments to satisfy special needs. They can represent a new class of advanced materials for catalytic applications because of specific metal support interactions given by their graphitic structure, which can improve the catalytic selectivity/activity as well as their specific surface area. CNTs exhibit extraordinary chemical, electrical, thermal and mechanical strength characteristics, allowing for several potential applications in biological materials catalysts. The development of clean oxidation processes is an important topic in current chemistry and industry. A new challenge is to make innovative, “clean” methods by using non-toxic solvents in particularly aqueous media. In this regard, the use of water as a reaction solvent has attracted great attention in the recent past and has become an active area of research in green chemistry.

In this work, simple iron porphyrins were immobilized on MWCNTs and characterized by Raman, nitrogen adsorption, FT-IR, SEM and TEM. These cost

efficient catalysts were used on an innovative heterogeneous strategy for clean and selective aqueous oxygenation alcohols at the present of m-chloro perbanzoic acid and tetra-n-butylammonium peroxomonosulfate. Recovery of Fe(TPP)Cl-MWCNT catalyst was easy and efficient by filtration for ten times without loss the activity.

Table 1. Oxidatin of alcohols in water by **nanohybrid of activated carbon nnotube-porphyrin**

Entry	Alcohol	Product[b]	Time (h)	Yield (%)[C]
1			1	90
2			1	85
3			2	85
4			2	85
5			1	90
6			2	85
7			2	75
8			1	95

References

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