Synthesis, characterization and catalytic activity investigation of a catalyst based on metalloporphyrin and titanate nanotubes (TNT)

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Introduction

The research involving heterogenization of porphyrins in inorganic supports as catalysts for oxidation reactions has grown since this process can promotes the recovery and reuse of the catalyst for many cycles[1]. Titanium and its compounds have been used in several areas e.g. as paint production, cosmetics and even in biological implants. In the recent years some advantages of the use of nanostructured materials based on titanium dioxide (such as the high surface area) has been explored for example for catalytic purpose[2].

In this work we report the preparation and characterization of the new catalyst based on the zinc(II) porphyrin (ZnP) ([5,10,15,20-tetrakis(4-hidroxy-3-metoxyphenyl) zinc (II)] – [Zn(T4H3MPP)]) and titanate nanotubes (TNT).

Results and Discussion

<u>TNT support synthesis:</u> the titanate nanotubes where obtained by alkaline hydrothermal treatment adapted from Xiangqing Li *et al.*[3] The tubular morphology of the obtained material can be confirmed by TEM and SEM microscopies (Figure 1).

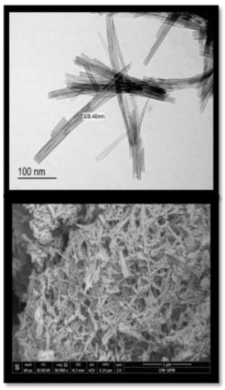

Figure 1. TEM (up) and SEM (down) images of the prepared TNT.

<u>Immobilization of the ZnP:</u> the immobilization of the ZnP in the prepared TNT took place by the stirring of the ZnP solution with the TNT solid in it by ultrasound. The presence of the ZnP was monitored by the electronic spectroscopy (UVVIS) (Figure 2).

<u>Catalytic activity investigation:</u> The catalytic activity of the prepared solid under heterogeneous process was preliminary investigated for cyclooctene oxidation (a diagnostic substrate) (Figure 3). As expected, the catalytic activity of the ZnP when immobilized was lower than the observed in solution (homogeneous catalysis). On the other hand, no leaching of the catalyst form the TNT was observed during the catalytic cycle suggesting that the prepared material can be reused.

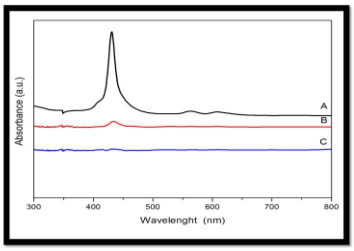

Figure 2. UVVIS spectra of: A) ZnP (methanolic solution), B) TNT+ZnP in nujol mull and C) TNT in nujol mull.

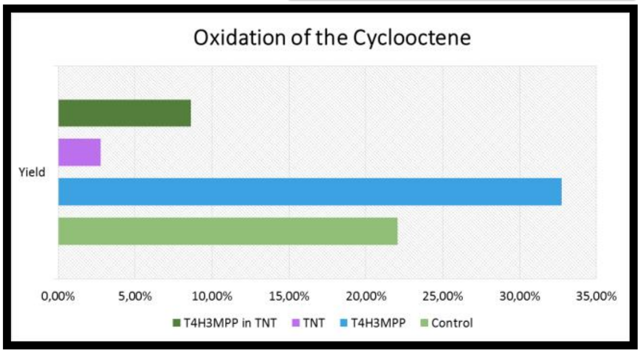

Figure 3. Catalytic activity preliminary tests performed with the obtained materials.

Conclusions

Titanate nanotubes material (TNT) was prepared, characterized, and used as support to the immobilization of ZnP. The solid obtained was used as catalyst in oxidation reaction and the preliminary results showed that in spite of the immobilization process decreased the catalytic activity of the ZnP, facilitate its recovery. The ideal catalytic condition for explore the catalytic potential of the material and the reuse capacity are under investigation.

Aknowledgement

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