



## Synthesis and Characterization of cerium phosphate (CeP)-based nanocomposites

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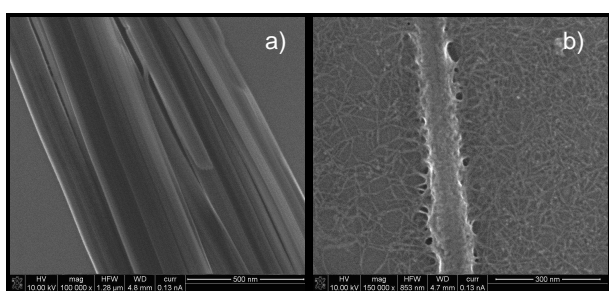
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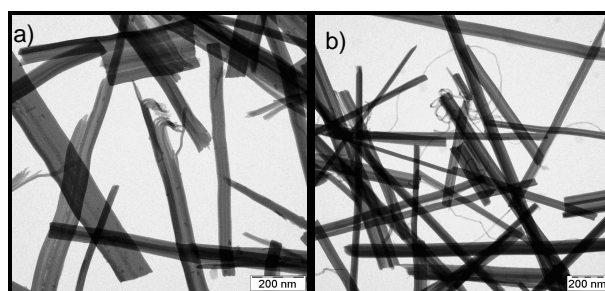
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**Abstract** – CeP-based nanocomposites have been obtained by addition of multi-wall carbon nanotubes (MWCNT) to cerium phosphate (CeP). The nanofibrils obtained on CeP synthesis (see Fig. 1a and 2a) was decorated with MWCNT in the CeP/MWCNT nanocomposites (see Fig. 1b).

CeP-based nanocomposites have been obtained by addition of multi-wall carbon nanotubes (MWCNT) to cerium phosphate (CeP). In this work, we report on the preparation of self-supported membranes of  $\text{Ce}(\text{HPO}_4)\cdot\text{nH}_2\text{O}$  and nanocomposites of CeP/MWCNTs. The production of CeP which were reported by Verissimo et al. [1] and its nanocomposites were obtained by using two different methods. In the preparation of CeP,  $(\text{NH}_4)_2\text{Ce}(\text{NO}_3)_6$  is added to the phosphoric acid at  $90^\circ\text{C}$ , under mechanical stirring. The system remained under these conditions during 20 hours; the product was washed until reach  $\text{pH}\sim 6,0$ . The product was filtrated and a self-supported membrane was obtained. During the addition of  $(\text{NH}_4)_2\text{Ce}(\text{NO}_3)_6$  it is promoted the formation of  $\text{Ce}(\text{HPO}_4)\cdot\text{nH}_2\text{O}$  nanofibrils (see Fig. 1a and 2a). In the first method, the preparation of CeP/MWCNT nanocomposites was done by adding MWCNT to the phosphoric acid at  $90^\circ\text{C}$  under mechanical stirring and after few minutes later the  $(\text{NH}_4)_2\text{Ce}(\text{NO}_3)_6$  was slowly added. The system remained under described conditions during 20 hours. The product was centrifuged and washed until reach  $\text{pH}\sim 6,0$ . The final product was filtrated and a self-supported membrane was obtained. During the addition of  $(\text{NH}_4)_2\text{Ce}(\text{NO}_3)_6$  it is promoted the formation of  $\text{Ce}(\text{HPO}_4)\cdot\text{nH}_2\text{O}$  nanofibrils (CeP) which are decorated with MWCNT in the case of CeP/MWCNT sample. These nanofibrils form interconnected bundles which is mimetic to cellulose (see Fig. 1b). The second method for preparing CeP/MWCNT consisted of adding MWCNT later CeP was prepared. A new cycle of 4 hours under mechanical stirring at  $90^\circ\text{C}$  was performed. Finally, the product was washed until reach  $\text{pH}\sim 6,0$ . The product was filtrated and a heterogeneous self-patterns indicated a typical lamellar stacking of CeP system. Raman spectra are characterized by bands at  $130 - 225 \text{ cm}^{-1}$  which indicates the structural order of CeP in agreement with X-ray diffraction data. The vibrational modes of phosphate group were also observed. In the case of nanocomposites the vibrational bands loose definition thus indicating that the CeP matrix is affected by the incorporation of MWCNTs. The self-supported membranes of CeP and CeP/MWCNT nanocomposites were characterized by SEM, TEM, FTIR, and TGA.



**Figure 1:** FEG-SEM image of CeP and CeP/MWCNT obtained at  $90^\circ\text{C}$ , **a)** CeP **b)** CeP/MWCNT (first method)



**Figure 2:** TEM image of CeP and CeP/MWCNT obtained at  $90^\circ\text{C}$ , **a)** CeP **b)** CeP/MWCNT (second method)

## References

[1] C Verissimo, O.L. Alves, Journal of Materials Chemistry, 13 (2003) 1378