



TÉCNICO
LISBOA



SOCIEDADE PORTUGUESA DE QUÍMICA



LIVRO DE RESUMOS

2016

ISBN 978-989-8124-13-5



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DEVELOPMENT OF MAGNETIC CARBON XEROGELS FOR CATALYTIC WET PEROXIDE OXIDATION

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Hybrid magnetic carbon composites have been recently proposed as the next step in the evolution of catalysts for catalytic wet peroxide oxidation (CWPO), with several synergistic effects arising from the combination of the high catalytic activity of metal species with the proven catalytic properties of carbon-based materials in CWPO [1]. Bearing this in mind, this work sought the development of novel magnetic carbon xerogels, composed by interconnected carbon microspheres with iron (Fe) and/or cobalt (Co) microparticles embedded in their structure. As inferred from the extensive characterization performed, materials with distinctive properties were obtained upon inclusion of different metal precursors during the sol-gel polymerization of resorcinol and formaldehyde, followed by thermal annealing. A carbon xerogel without added metals (CX) was also prepared for comparison purposes. The performance of the carbon xerogel materials in CWPO was evaluated using highly concentrated 4-nitrophenol solutions (4-NP, 5 g L⁻¹). As observed in Figure 1, an important synergistic effect between phases arises when Co and Fe are simultaneously included in the carbon xerogel denoted as CX/CoFe, when its performance in CWPO is compared to that of the monometallic CX/Co and CX/Fe, as well as with the bare CX. The improved performance of CX/CoFe was ascribed to the enhanced accessibility of Fe species promoted by the simultaneous inclusion of Co.

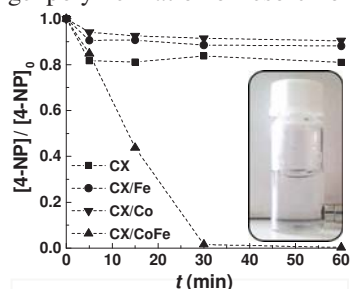


Figure 1. 4-NP removal from concentrated aqueous solutions (5 g L⁻¹) obtained in CWPO runs performed with the carbon xerogel materials in the presence of stoichiometric amounts of H₂O₂. Inset: magnetic separation of CX/CoFe.

Acknowledgements

This work was financed by FCT and FEDER through COMPETE 2020 (Project UID/EQU/50020/2013 - POCI-01-0145-FEDER-006984). R.S. Ribeiro acknowledges the FCT individual Ph.D. grant SFRH/BD/94177/2013, with financing from FCT and the European Social Fund (through POPH and QREN). A.M.T. Silva acknowledges the FCT Investigator 2013 Programme (IF/01501/2013), with financing from the European Social Fund and the Human Potential Operational Programme.

[1] R.S. Ribeiro, A.M.T. Silva, J.L. Figueiredo, J.L. Faria, H.T. Gomes, *Appl. Catal.*, B 187 (2016) 428-460.