
RGC
I REUNIÃO DO GRUPO DO CARBONO
I MEETING OF THE CARBON GROUP
12-13 / junho / 2017 PORTO
Sociedade Portuguesa de Química
Grupo da Carbono

CORE-SHELL MAGNETIC CARBON NANOCOMPOSITES FOR CATALYTIC WET PEROXIDE OXIDATION

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The application of heterogeneous metal/magnetic phases in catalytic wet peroxide oxidation (CWPO), either directly as catalyst or included in distinct support/hybrid materials, has been receiving great attention from the scientific community. Under this context, our recent work has been mainly focused on the development and application of composite materials combining highly active and magnetically separable iron-based materials with the easily tuned properties of carbon-based materials [1]. As a result, the outstanding performance of a hybrid magnetic graphitic nanocomposite (MGNC) catalyst – composed by a magnetite (Fe_3O_4) core and a graphitic shell – was recently reported [2].

Seeking to improve catalytic performance, two additional magnetic materials were prepared and encapsulated within a graphitic shell. The resulting MGNC materials were applied as catalysts in the CWPO of 4-nitrophenol (4-NP) aqueous solutions with high load (5 g L^{-1}). The MGNC material with the highest catalytic activity and stability for CWPO was the subject of additional studies, including the assessment of the (i) adsorption influence on the removal of 4-NP by CWPO, (ii) mineralization achieved in terms of total organic carbon removals, (iii) chemical oxygen demand removals, (iv) efficiency of hydrogen peroxide consumption, (v) heterogeneous nature of the catalytic system, (vi) participation of hydroxyl radicals in the CWPO process and (vii) 4-NP oxidation mechanism. In addition, a lab-scale magnetic separation system was designed for in-situ catalyst recovery after the CWPO reaction stage.

Acknowledgments. This work was financially supported by: Project POCI-01-0145-FEDER-006984 – Associate Laboratory LSRE-LCM funded by FEDER through COMPETE2020 - Programa Operacional Competitividade e Internacionalização (POCI) – and by national funds through FCT. R.S. Ribeiro and R.O. Rodrigues acknowledge the FCT individual Ph.D. grants SFRH/BD/94177/2013 and SFRH/BD/97658/2013, respectively, 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.

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[2] R.S. Ribeiro, A.M.T. Silva, P.B. Tavares, J.L. Figueiredo, J.L. Faria, H.T. Gomes, *Catal. Today* 280 (2017) 184