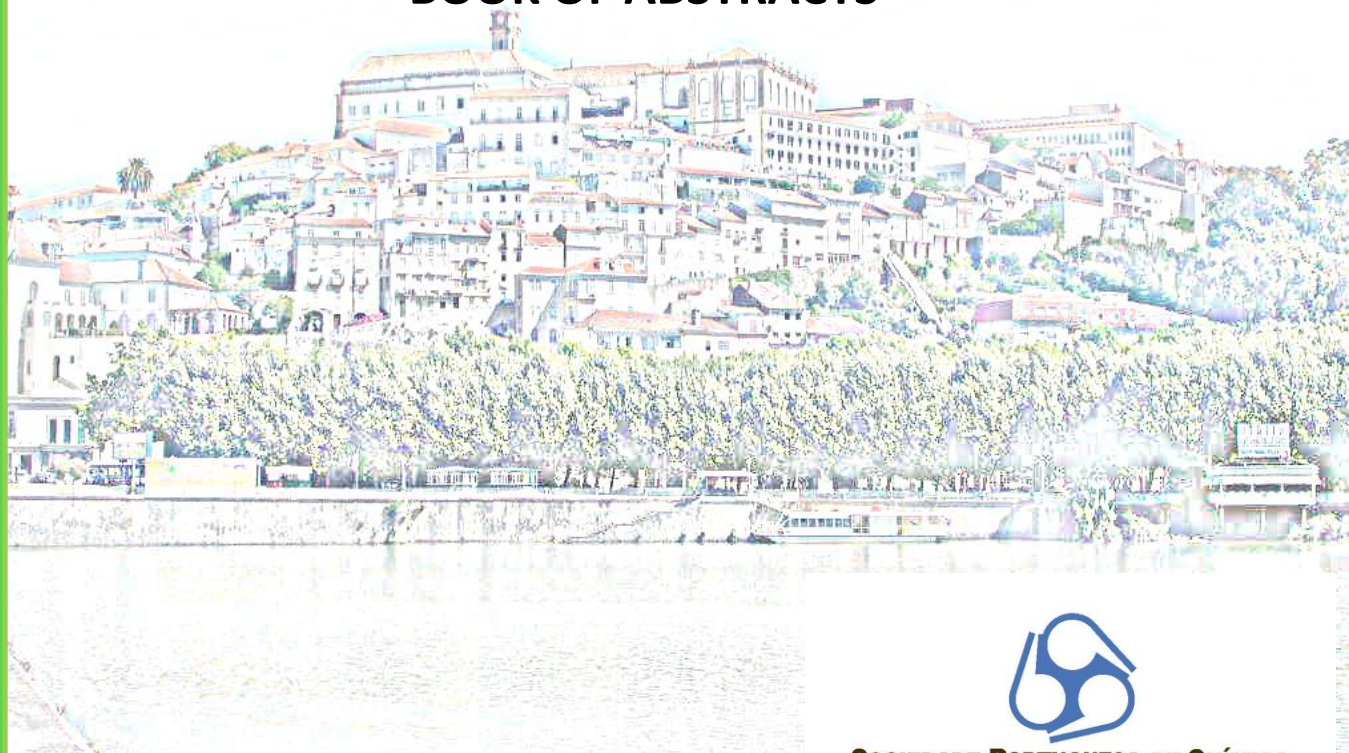


1-3 July 2015 COIMBRA PORTUGAL

**XXIV ENCONTRO  
NACIONAL** da  
Sociedade Portuguesa de Química



**LIVRO DE RESUMOS  
BOOK OF ABSTRACTS**



**SOCIEDADE PORTUGUESA DE QUÍMICA**

## P-09 N, B AND P DOPED CARBON BLACKS FOR THE CWPO OF 4-NITROPHENOL SOLUTIONS

J. L. Díaz de Tuesta<sup>1,2</sup>, A. Quintanilla<sup>2</sup>, J. A. Casas<sup>2</sup>, J. J. Rodríguez<sup>2</sup>, R. S. Ribeiro<sup>1</sup>, A. M. T. Silva<sup>3</sup>, J. L. Faria<sup>3</sup>, H. T. Gomes<sup>1</sup>

<sup>1</sup>LCM – Laboratory of Catalysis and Materials – Associate Laboratory LSRE-LCM, Polytechnic Institute of Bragança, Portugal.

e-mail: [htgomes@ipb.pt](mailto:htgomes@ipb.pt)

<sup>2</sup>Sección Departamental de Ingeniería Química, Facultad de Ciencias, Universidad Autónoma de Madrid, Cantoblanco, Ctra. de Colmenar km 15, 28049 Madrid, España

<sup>3</sup>LCM – Laboratory of Catalysis and Materials – Associate Laboratory LSRE-LCM, Departamento de Engenharia Química, Faculdade de Engenharia, Universidade do Porto, Portugal

A previous work has demonstrated that the Chemviron Carbon Black (CB, ref.:2156090) is a catalyst capable to combine a good activity with an adequate stability for long term use and high efficiency of H<sub>2</sub>O<sub>2</sub> consumption in the CWPO of phenol [1]. In the current work, this catalyst was tested for the oxidation of 4-nitrophenol (4-NP). Furthermore, the catalyst was doped with nitrogen, boron and phosphorous in order to increase its activity. Doped Carbon Blacks (DCBs) were prepared by a single step heat-treatment of CB at 900 °C in N<sub>2</sub> atmosphere during 24 h, using urea, boric acid or phosphoric acid as N, B and P sources, respectively. The CWPO runs were carried out in a magnetically stirred necked glass reactor equipped with a reflux condenser. The evolution of 4-NP was monitored by a Jasco HPLC system according to a previous work [2]. DCBs exhibited higher activity than the undoped CB (Fig. 1-A). Remarkably, CB doped with phosphoric acid (P-DCB) leads to total conversion of 4-nitrophenol after 24 h at 50 °C. When the reaction is carried out at 80 °C, only 4 h were needed to achieve the same conversion (Fig. 1-B).

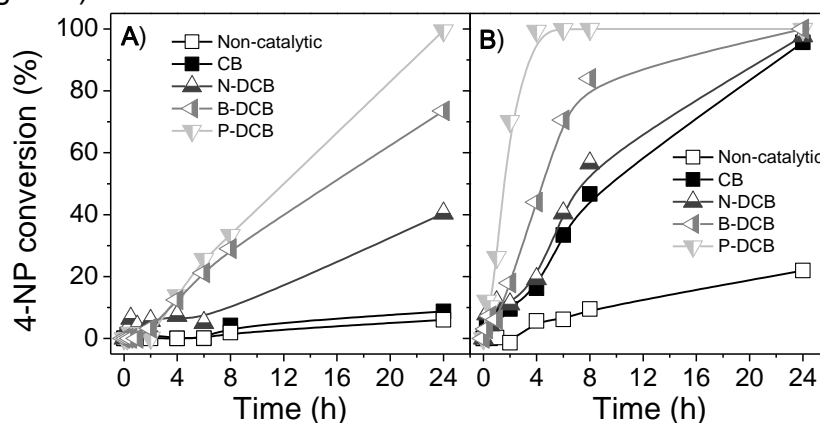


Figure 1: 4-nitrophenol conversion at pH = 3, 2.5 g/L of catalyst, 5 g/L of 4-nitrophenol, stoichiometric amount of H<sub>2</sub>O<sub>2</sub> needed for the complete mineralization of 4-nitrophenol and (A) 50 °C or (B) 80 °C.

**Acknowledgements:** This work was co-financed by the Spanish MINECO (project CTQ2013-41963-R), CM (project S2013/MAE-2716) and the Portuguese FCT/MEC/FEDER under Program PT2020 (projects UID/EQU/50020/2013 and NORTE-07-0124-FEDER-000015). J.L. Díaz de Tuesta thanks the MECD (Spain) for the FPU grant. R.S. Ribeiro and A.M.T. Silva the financial support from the FCT Ph.D. grant SFRH/BD/94177/2013 and from the FCT Investigator 2013 Programme (IF/01501/2013), respectively.

[1] Díaz de Tuesta, J. L.; Domínguez, C. M.; Quintanilla, A.; Casas, J. A.; Rodríguez, J. J. *ANQUE ICCE BIOTEC 2014 CONGRESS (Spain)*.

[2] Ribeiro, R. S.; Silva, A. M. T.; Pastrana-Martínez, L. M.; Figueiredo, J. L.; Faria, J. L.; Gomes, H. T. *Catalysis Today*, **2015**, 249, 204-212.