

# Book of Abstracts

**C** XI National Meeting on  
**Catalysis and Porous Materials**

**C** II Meeting of the  
**Carbon Group**

9<sup>th</sup> - 10<sup>th</sup> december 2021, Aveiro, Portugal

***Title***

Abstract book of the XI National Meeting on Catalysis and Porous Materials and the II Meeting of the Carbon Group

***Editors***

*Diana C. G. A. Pinto, Martyn Pillinger, Anabela Valente and Mário Simões*

***Photo Editor***

*José M G Pereira*

## Selective oxidation of quinoline in an emulsified system using carbon nanotubes derived from LDPE as catalysts: pH effect

Fernanda F. Roman<sup>a,b,c</sup>, Jose L. Diaz de Tuesta<sup>a</sup>, Adrián M. T. Silva<sup>b,c</sup>, Joaquim L. Faria<sup>b,c</sup>, Helder T. Gomes<sup>a</sup>

<sup>a</sup>Centro de Investigação de Montanha (CIMO), Instituto Politécnico de Bragança, 5300-253 Bragança, Portugal. <sup>b</sup>Laboratory of Separation and Reaction Engineering – Laboratory of Catalysis and Materials (LSRE-LCM), Faculdade de Engenharia, Universidade do Porto, 4200-465 Porto, Portugal. <sup>c</sup>ALiCE – Associate Laboratory in Chemical Engineering, Faculdade de Engenharia, Universidade do Porto, Rua Dr. Roberto Frias, 4200-465 Porto, Portugal. E-mail: roman@ipb.pt

Nitrogenated compounds are naturally found in petroleum-based products. Upon their combustion, hazardous gases ( $\text{NO}_x$ ) are generated, leading to environmental and health issues. To overcome the downsides related to nitrogen oxides,<sup>1</sup> catalytic oxidative denitrogenation (ODN) with  $\text{H}_2\text{O}_2$  is currently seen as a suitable alternative to traditional hydrodenitrogenation. In this work, the catalysts for ODN consisted of carbon nanotubes synthesized from low-density polyethylene as a carbon source by chemical vapor deposition (850 °C, 1 h). A simulated fuel was prepared by dissolving quinoline (QN) in 2,2,4-trimethylpentane ( $[\text{N}]_0 = 50$  ppm,  $[\text{QN}]_0 = 460$  ppm). ODN was carried out in an emulsified system (80:20 2,2,4-trimethylpentane:water,  $V_{\text{total}} = 20$  mL) at 50 °C, 4 h,  $C_{\text{catalyst}} = 2.5$  g L<sup>-1</sup> and  $V_{\text{H}_2\text{O}_2, 30 \text{ wt.\%}} = 0.9$  mL (5.5× the stoichiometric ratio for QN mineralization). The emulsion was formed by sonication for 15 min. The obtained results are summarized in Fig. 1. ODN carried out at the initial pH ( $\text{pH}_0$ ) 3.5 resulted in 74% of QN removal from the oil phase, which is far higher when compared to only 15% removal occurring by mass transference (test conducted with an aqueous phase free of  $\text{H}_2\text{O}_2$  and catalyst). At  $\text{pH}_0 = 6.5$ , QN removal from the oil phase decreased drastically to 33%, indicating that a lower pH favor QN removal.

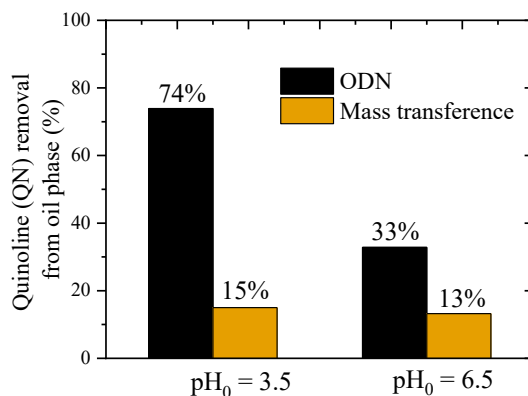


Figure 3. QN removal from oil phase at different initial pHs by ODN and mass transference.

### References

[1] Prado, G. H. C.; Rao, Y.; de Klerk, A.; *Energy Fuels*, **2017**, 31, 14-36.

**Acknowledgments:** This work was financially supported by project “PLASTIC\_TO\_FUEL&MAT – Upcycling Waste Plastics into Fuel and Carbon Nanomaterials” (PTDC/EQU-EQU/31439/2017), by Base-UIDB/50020/2020 and Programmatic-UIDP/50020/2020 funding of LSRE-LCM - funded by national funds through FCT/MCTES (PIDDAC), and CIMO (UIDB/00690/2020) through FEDER under Program PT2020. Fernanda F. Roman acknowledges the Foundation for Science and Technology (FCT) and the European Social Fund (FSE) for the individual research grant with reference SFRH/BD/143224/2019.