"REMEDIATION OF POLLUTED ENVIRONMENTS BY COMBINATION OF ENVIRONMENTALLY FRIENDLY PROCESSES", A SHORT INTRODUCTION:

The PhD Thesis entitled "Remediation of Contaminated Environments by Combination of Environmentally Friendly Processes" focused on the elimination of diverse pollutants from wastewater and polluted soils by the application of Advanced Oxidation Processes (AOPs). Thus, it has been redacted as a compendium of 10 articles published in international journals of Q1 and Q2.

Among the different AOPs, it has been mainly centered on the elimination of organic compounds by electro-Fenton treatment. On this treatment, the key parameters limiting Fenton's reaction are iron and H_2O_2, *in situ* regenerated and generated at the cathode surface. On this framework, one of the main drawbacks associated to the homogeneous process it the generation of an iron sludge at the end of the treatment. To overcome this shortcoming, on the studies described in Arts.1, 2 and 3 of this PhD Thesis, heterogeneous catalysts (iron loaded polyacrylamide hydrogels (Art.1), iron alginate beads hydrogels (Art.2) and iron loaded activated carbon (Art.3)) able to efficiently adsorb and retain iron were developed, characterized and used as iron catalyst during the electro-Fenton treatment of different kinds of pollutants. On the other hand, to improve the electrogeneration of H_2O_2 on the cathode surface, different electrode materials such as nickel foam (Art.4), coated nickel foam (Art.5) and carbon felt (Art.2) were evaluated.

Likewise, the efficiency of other AOPs for the remediation of polluted water (anodic oxidation (Art.6) and photo-Fenton processes (Art.7) has been tested. Furthermore, the combination of electro-Fenton and photo-Fenton treatment (photoelectron-Fenton technology) showed promising results, achieving the complete elimination of the selected compound in shorter treatment time than both individual technologies. Note that this study was developed in the "Laboratoire Géomatériaux et Environnement", under the supervision of Prof. M.A.Oturan (Université Paris-Est Marne-la-Vallée, from 01/09/2014 to 01/12/2014), worldwide renewed by its experience on the application of AOPs for the remediation of polluted water.

After the satisfactory results obtained by this hybrid treatment, the possibility to couple a technology already integrated on the industry like electrocoagulation, with electro-Fenton process for the remediation of a simulated wastewater was evaluated (Art.8), finding promising and interesting results. This study was accomplished in the "Laboratory of Electrochemistry of Material and Environment", managed by the Prof. Brillas (from 01/09/2015 to 01/12/2015). Additionally, the remediation of a polluted soil was successfully accomplished by soil flushing and electrokinetic-Fenton technology using citric acid as complexing agent (Art.9). Finally, Art.10 deals with an original and innovative idea, which is to employ Screen-Printed electrodes as transducer in a dynamic and chemically reactive system. To our best knowledge these sensors have not been previously used on this topic, neither electroanalysis by Differential Pulse Voltammetry to monitor *in situ* remediation processes such as electro-Fenton.

It must be highlighted that in order to be awarded with the title provided by the "European AOPs PhD School", this PhD Thesis was defended at the University of Vigo, the 23th of June, under the supervision of the Dr. Mª Ángeles Sanromán Braga and Dr. Marta Pazos Curras, both members of the scientific committee of the AOP School. Moreover, the Dr. Vitor Jorge Pais Vilar (University of Porto) and Aurora Santos (Universidad Complutense de Madrid), members

as well of the scientific committee of the AOP School, were included on the evaluation committee of this PhD Thesis, finally qualified with the grade of “Sobresaliente, Cum Laude”.