

“ELECTRO-FENTON AND ADSORPTION AS APPROACH TOWARDS A COMPREHENSIVE REMEDIATION OF EFFLUENTS WITH DIFFERENT TYPES OF POLLUTANTS”, A SHORT INTRODUCTION:

This PhD thesis “Electro-Fenton and adsorption as approach towards a comprehensive remediation of effluents with different types of pollutants” has presented as a compendium of five articles published in indexed journals. All these publications are focused on searching other alternative technologies for an efficient wastewater treatment. Conventional treatments have been widely used to remove organic and inorganic pollutants from wastewater, the presence of novel contaminants and/or stricter water quality standards require the search for appropriate alternatives.

Water pollutants include inorganic ions and organic chemicals widely detected and commonly denoted as traditional pollutants and the emerging pollutants as pharmaceutical products and even, pesticides with quite low concentration on surface water. Although ionic liquids have not been detected in the water cycle, their properties suggest environmental concerns and for this reason, they are considered as contaminants on the horizon.

Within this context, this PhD Thesis is focused on the remediation of traditional contaminants such as industrial dyes and heavy metals, more specifically chromium (VI), from textile industries, emerging pollutants including neonicotinoid pesticides as thiamethoxam and acetamiprid and even, p-nitrophenol as model pesticide metabolite and finally, the ionic liquids considered by their recent use as “contaminants on the horizon”.

A comparative study between several advanced oxidation processes including anodic oxidation, Fenton’s reaction and their combination was carried out to evaluate the degradation and mineralisation of target contaminants (Art.1). In addition, chemical processes are inherently complex with multiple involved variables and hence, process simulation by mathematical model was developed to allow a deep knowledge about the electro-Fenton process (Art.2). Afterwards, the development of heterogeneous catalyst with negligible iron leaching and high mechanical strength and durability was required to avoid the operational problems related to the use of soluble iron salt as homogeneous catalyst (Art. 3). A noteworthy issue is associated to the use of electro-Fenton process since the

release of inorganic ions such as nitrate, ammonium and chloride leads water quality deterioration. Thus, electro-Fenton process should be supplemented by other technologies such as adsorption to recover the inorganic ions from water and ensure their quality (Art.4).

Global pollutants removal represents an astonishing challenge on scientific community. In the light of this fact, the operational limitations of electro-Fenton process require the search for another process able to remove inorganic contaminants from wastewater. For this reason, in this PhD Thesis, the removal of traditional contaminants of different chemical nature, chromium and dyes from tannery effluent was evaluated by adsorption process (Art. 5).

To obtain the International Mention Doctorate, a research stay at Energy Technology Group (University of Southampton, United Kingdom) was carried out under the supervision of Dr. Carlos Ponce de Leon for three months (September-December 2016) to develop electrodes to enhance the process effectiveness.

To be awarded with the title provided by the “European AOPs PhD School”, this PhD Thesis was defended at the University of Vigo, on the 19th February, under the supervision of the Dr. M^a Ángeles Sanromán Braga and Dr. Marta Pazos Currás, both members of the scientific committee of the AOP School. Moreover, the Dr. Adrian Manuel Tavares da Silva (University of Oporto, Portugal), member as well of the scientific committee of the AOP School was included on the evaluation committee of this PhD Thesis, finally qualified with the grade of “Sobresaliente Cum Laude”.