

Treatment of the rejection water from a membrane treatment plant by electrochemical processes.

Ignacio Sanjuán Moltó

Instituto de Electroquímica, Universidad de Alicante, 03080, Alicante, España.
nacho.sanjuan@ua.es

Fresh water is vital for the human being and for the development of society. Although renewable, it is a very limited resource since is available only in a 0.6 % for human use and consumption. As well, in recent years, there has been a decrease in these natural resources due to the global warming and an unsustainable consumption by the industrial sector [1]. It is not surprising that many researchers are working to find strategic solutions to this water problem. One possible solution may be the reuse of wastewater.

The goal of this PhD thesis deals with this issue. It consists of carrying out a treatment of the rejected water from a membrane treatment plant by electrochemical processes, in order to increase the percentage of recovered water by the plant. Electrochemical techniques present several advantages which are mainly environmental compatibility, no handle and addition of chemical reagents necessarily and good process control. This water presents a remarkable concentration of calcium, magnesium, nitrate and sulphate ions and a low concentration of organic matter. Therefore, it cannot be treated directly by conventional techniques such as reverse osmosis membrane or electrodialysis but it is perfectly suitable for electrochemical treatments [2]. Accordingly, the following electrochemical techniques were proposed: electroprecipitation, capacitive deionization and electroreduction. At first, each technique will be studied in the laboratory scale to assess the feasibility and to optimise the parameters influencing the process (current density, temperature, reactor configuration, feed pH, electrode material, etc.). In the last stage, we will proceed to the scaling up towards the preindustrial pilot scale, where the operating conditions can be evaluated: modes of operation, efficiency values, energy consumption, flow rate and ion removal ratios. Moreover, a fundamental part of the study is to investigate whether the already mentioned technologies can be applied as a single treatment or whether they have to be applied in a sequential manner. In the latter case, the order of application will be determined.

ADVISERS/MENTORS

Vicente Montiel Leguey, Inst. de Electroquímica, Univ. de Alicante. E-mail: vicente.montiel@ua.es

Eduardo Expósito Rodríguez, Inst. de Electroquímica, Univ. de Alicante. E-mail: eduardo.exposito@ua.es

Acknowledgements: Author would like to acknowledge the scholarship granted and the material and human resources provided by the University of Alicante and the company Aguas de Valencia, S.A.

References:

- [1] F.A. AlMarzooqi, A.A. Al Ghaferi, I. Saadat, N. Hilal, Desalination 342 (2014) 3.
 - [2] D. Hasson, G. Sidorenko, R. Semiat, Desalination and Water Treatment 31 (2011) 35.
-