EFFECTIVE DEGRADATION OF IBUPROFEN THROUGH AN ELECTRO-FENTON PROCESS IN THE PRESENCE OF ZERO-VALENT IRON

M. Minella, L. Martone, C. Minero, F. Sordello, D. Vione
Dipartimento di Università di Torino, Dipartimento di Chimica, Via Pietro Giuria 7, 10125 Torino, Italy.

Considerable scientific interest has arose recently about the so-called contaminants of emerging concern (CECs) because these compounds are recalcitrant to biodegradation, and too hydrophilic to be easily partitioned on solid adsorption phases, or eliminated from water with the spent bacterial sludge.[1] Therefore, CECs are often released by traditional wastewater treatment plants into surface-water acceptor bodies, where they can produce harmful effects to living organisms. [2] Numerous technologies (denoted as Advanced Oxidation Processes) have been proposed for the production of highly reactive species able to completely degrade CECs.
Among the proposed AOPs, the Fenton and Fenton-like processes are promising techniques for the removal of highly recalcitrant contaminants.[3] The optimization of the processes and the comprehension of the operational mechanisms (e.g. the identification of the most important reactive species and the transformation pathways for the degraded compounds) are challenging. The classic problem solving approach of the analytical chemistry and the specific tools of "our" discipline (e.g. speciation study, identification and quantification of the main species…) are essential to give insights into the complexity of the Fenton and Fenton-like processes.
As an example, modified ZVI-Fenton with gradual and *in-situ* electrochemical generation of H_2O_2 has been investigated to remove the non-steroidal, anti-inflammatory drug ibuprofen and to avoid $^{\bullet}OH$ scavenging by a single large dose of H_2O_2.[4] ZVI-electro-Fenton achieved complete degradation under a variety of conditions, including pH 6 (more compatible with water treatment, than the more acidic pH values often needed by Fenton processes). A correct ratio between ZVI loading and H_2O_2 production rate (electrochemically controlled) is fundamental for ibuprofen degradation. Low ZVI loading coupled with the application of square-wave potential achieved good performance in the degradation of ibuprofen, with considerable resource economy in terms of materials and energy supply.

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