FENTON AND DIFFERENT LIGHT SOURCE ASSISTED PHOTO-FENTON REACTIONS FOR THE PURIFICATION OF REAL THERMAL WASTEWATER

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Abstract

Thermal water has a numerous fields of applications thanks to its beneficial features. Due to its high temperature, thermal water can be used as energy source and another main application field is therapeutic utilization [1]. Thermal water often contains high amount of inorganic and/or organic contaminants, therefore its purification is required before the final disposal [2]. Although phenolic and humic substances can be successfully degraded by ozone treatment, the high radical scavenger content of salty thermal waters often prevents the effective COD or TOC reduction [3]. In the present study the oxidative purification of a real thermal wastewater (with high hardly oxidizable organic content and high carbonate concentration) was investigated comparing different AOPs, such as Fenton reaction, and photo-Fenton reactions with different light sources (additionally ozone treatment was also investigated as a reference purification method). Investigating the effect of ferrous ion content and hydrogen-peroxide concentration, the 1:25 molar ratio was found to be the most effective in relation with the absolute value of COD and TOC reduction rate. The investigation of the effect of different light sources (UV-A, UV-C and VUV fluorescence tubes with intensity maximums at 360, 254 or 254/180 nm and visible light emitting tube) revealed that both the purification efficiency, and the "apparent quantum yield" of COD or TOC reduction increased with the energy of photons (decreased with the wavelength of photons) possibly due to the more effective regeneration of Fe^{2+}, and the parallel processes like direct photolysis of organic contaminants (both in case of UV-C and VUV irradiation) and direct production of hydroxyl radicals from water molecules (only in case of VUV irradiation).

Key words: Fenton reaction, photo-Fenton treatments, ozonation thermal water, AOPs

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