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Letter to the Editor: Regarding the "Simultaneous Removal of Turbidity and Humic Acid Using Electrocoagulation/Flotation Process in Aqua Solution"

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Dear Editor,

We would like to comment on the above paper, which was published in *Avicenna J Environ Health Eng* 2(1) 2015 (1). The study is worthwhile in terms of its application of green methods for removing humic acid (HA) and turbidity. However, we would like to point out some deficiencies in the study design.

The authors have claimed that they have employed an electrocoagulation process for the coagulation and flocculation of the pollutants and air spray through an air pump for floatation; the role of scarified anode of aluminum and iron is to produce metal ions and, in turn, coagulant agents $Fe(OH)_3$ and $Al(OH)_3$, but, in this study, the authors have not dealt with the role of cathodes because, based on the following reactions, water is reduced and hydrogen gas is created. This plays an important role in flotation. It should be noted that an air spray can only contribute to the electrocoagulation process. The process of electrocoagulation includes a series of reactions, such as coagulation, flocculation and floatation; the authors have not mentioned these reactions, as follows (2):

Equilibrium 1.

$2H_2O + 2e^- \rightarrow H_{2\,(g)} + 2OH^-$

Equilibrium 2.

$2H_3O^+ + 2e^- \rightarrow 2H_2O + H_{2\,(g)}$

The authors have applied the hybrid process of electrocoagulation/flotation to treat the pollutants and optimized only the variables of electrocoagulation: solution pH, electrical potentials, initial turbidity concentration, and reaction time with or without HA. It is also important to optimize flotation variables such as airflow rate and the size of gas bulbs.

Another point to make here is to question why the authors have optimized the electrical potential. We believe that they should have optimized the current density. It is thought that current density is entirely important in industrial and economical applications. The use of fixed potential to make sure of oxidation or the reduction of a certain species is clear. Therefore, in order to optimize electrochemical methods, the fixed current phase is used. This enables us to study projects in terms of economic and energy consumption features and scaling up.

In this study, the comparison of theoretical consumption and laboratorial consumption of the electrodes aluminum and iron, as well as energy consumption calculations, have not been tackled, though they are very important (3, 4).

$$W_{theoretical} = (JtM)/(nF) \quad (1)$$

$$W_{experimental} = W_{before} - W_{after} \quad (2)$$

$$E = \left(UIt_{EC}\right) / V_{EC} \quad (3)$$

where U was the voltage (V), I was the applied electrolysis current (A), t_{EC} was the electrolysis time (h) and V_{EC} was the reactor volume (m^3), W is the quantity of anode material dissolved (g of Al and Fe cm^{-2}), J the current density (A cm^{-2}), t the run time (s), M the relative molar mass of aluminum, n the number of electrons in oxidation/reduction reaction (n = 3), F the Faraday's constant (F = 96.500 $Cmol_{-1}$), W_{before} and W_{after} are respectively the experimental anode weight before and after electrolysis.

Another problem with the article is that pH variations have not been reported regarding the reactions. However, in most studies on the application of the electrocoagulation measure for treating pollutants in water, the pH value has been reported to fluctuate, even to two units (5, 6); thus, special buffer solutions should be used for pH optimizations.

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