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Civil Engineering 2016 : Key Parameters Optimization in the Electro-Coagulation-Flotation process for synthetic WasteWater Treatment Containing Acid Red 14 – HosseinGanjidoust - TarbiatModares University

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Due to the potential contamination of groundwater and surface water in the vicinity of the consumer dye industry, removal of this dyestuff waste is an environmental priority. Water clarity and solubility of gases in the presence of even a small amount of dye is reduced. If there are colored substances toxic to lower layers light penetration in the water is low and photosynthesis of aquatic plants and the amount of dissolved oxygen is so low that aquatic animals destroyed. Dyes are stable compounds that are not easily biodegradable and especially azo dyes are considered carcinogenic. Removal of color via various methods of physical, chemical, biological or a combination of them is possible that can be noted on physical methods such as adsorption, membrane filtration and ultrasonic waves, chemical methods such as ion exchange, electrolysis, coagulation and flocculation, canonical and advanced oxidation and biological methods using algae, fungi and bacteria. Chemical coagulation is a common method of waste water containing dye. High levels of dissolved solids and sludge in purified effluent is the disadvantage of chemical coagulation. In recent years, electrochemical method because of the versatility and compatibility with the environment as an effective method for treating wastewater of containing dye industries is taken into consideration. In the electric coagulation, production happens in place of coagulant materials that are result of dissolution metal anode (steel) by passing an electric current. If between the positive anode and negative cathode that are plugged to electricity, put sewage, an electric field is established as a result of the electrical conductivity of the solution. By electrolysis of water, tiny bubbles of oxygen and hydrogen produced, and to move upwards and form a blanket on the surface. Bubbles bring suspended particles to the surface and form sludge layer that are mechanically collected. Expected use of electric flotation process simultaneously with electric coagulation eliminates requirement to gravity sedimentation unit for the separation the clots and resulting in the separation of both emissions and reduce the cost of the filtration. Researches in the field of electrochemical dye degradation based on electric coagulation and flotation property of the produced bubble is rarely used. In this study, reactors designed in a manner intended to electric coagulation properties and electric flotation can be used simultaneously. In addition, in this study are used innovations such as the use of grille stainless steel electrodes with horizontal arrangement. In this study, the important factors affecting the performance of the synchronized electric conclusion and electric flotation system at the; Including electrical conductivity of the solution and initial pH were completed checked out and the effect of these parameters on the removal efficiency of acid red 14 from synthetic wastewater, and energy consumption values and anode are determined and optimized. The electrical conductivity 3600 µS/dm and initial pH equal 9 were selected as optimal values and under optimal conditions and the duration of 25 minutes, 99% removal efficiency of dye with initial concentration 250 mg/L is reached and specific energy consumption" 9.5 kWh/kg Dye Removed", anode consumption "2.65 Fe /kg Dye Removed" and TSS sludge 9000 mg/L was obtained.. Advantages of this method include very low consumption of Materials and energy (according to the high rated initial concentration of the dye (250 mg/L) and a small applied intensity electric current (0.4 A) in this study) as well as low produced sludge that resulted to reduce filtration and sludge disposal costs can be noted. Require to simple equipment, high speed and short retention time remove pollutants, easy navigation, require to low amount of chemicals and low produced sludge which has high sedimentation or floating rate with low amount of water are other advantages of this method compared to other methods of dye removal. As a result, this method can be used as an suitable alternative for common filtration methods such as chemical coagulation and flocculation or pre-filtration prior to supplementary filtration of industrial sewage containing dyes.

Different measures of various substance colors from various mechanical applications including coloring were used. Fake colors are viewed as toxins of nature

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that
go into the earth with modern waste and at last can cause sullying of characteristic environments, for example, soil, surface waters, ground waters and living animals. At the point when hued wastewaters are released into the earth without treatment, they can influence sea-going biological systems in various manners. The presence of a shaded substance in water diminishes the light infiltration to the lower layers thus diminishes the photosynthesis of plants which delivers the water harmful bringing about the mortality of amphibian animals lastly the waterways and streams that the wastewaters stream into, going them to overwhelm in the more extended term (Zodi et al. 2013). Shading evacuation is conceivable through various physical, compound, and natural strategies or a blend thereof. Physical techniques incorporate, for example, assimilation, ingestion, film filtration, and ultrasonic waves; substance strategies incorporate particle trade, electrolysis, coagulation, regular, and propelled oxidation; and natural strategies utilizing green growth, parasites, and microorganisms can be referenced (Alinsafi et al. 2005; Kobya et al. 2006; Hooshmandfar et al. 2016). In concoction coagulation, electrostatic gravity between the color arrangement and polymeric particles with inverse burdens create coagulation. The drawbacks of this technique are high ooze creation and high broke down solids in rewarded wastewaters. Compound coagulation is productive for sulfurous and scatter colors. Acidic, direct, tank and responsive colors coagulate with this strategy however don't settle, while cationic colors don't coagulate (Can et al. 2006).

The electrochemical technique is a superior treatment strategy with high productivity for rewarding material wastewaters which contain a high convergence of color. This strategy has favorable circumstances over others for decolorization, for example, the requirement for straightforward gear, better, and shorter maintenance time to evacuate contaminants, simpler activity, and less requirement for synthetic concoctions (Yildiz 2008).

Electro-coagulation produces coagulating substances in situ utilizing electrical decay of aluminum (Al) or iron (Fe) anodes. Fe particles that are added electrically to water as indicated by response, are considerably more dynamic than Fe particles that are included artificially. Where there is wastewater between the positive anode and negative cathode, an electric field is built up because of the arrangement's electrical conductivity. By electrolysis of water, fine air pockets of oxygen and hydrogen are created by response and move upward and structure a layer in the surface. Air pockets carry the suspended particles and oil to the surface and a slime layer is created that is precisely gathered. In this way, free nuclear oxygen is framed in the anode dispersion layer and enters the wastewater by convection and oxidizes natural and inorganic substances. In a comparable pattern, a change happens in roused electrical hydrogen that prompts the recovery response of wastewater substance. As per response (3), alkalinity is delivered as OH^- at the cathode during the electrolysis. Gases creating oxygen and hydrogen (as indicated by response 4) are extremely dynamic, and when they assault the outside of the solids, change their lightness properties. These progressions are called electrochemical impacts which don't exist in other lightness (Matis and Peleka 2010). Concoction responses happening at the anode and cathode are appeared beneath in responses (Khandegar and Saroha 2013)

Biography:

HosseinGanjidoust completed his PhD in 1988 from University of Missouri-Rolla, USA He is the Professor of Civil & Environmental Engineering at TarbiatModares University, Iran. He has published more than 105 papers in reputed journals and books and has been serving as an Editorial Board Member on several journals. He has undertaken research and acted as high level consultant in various Industries and Companies.

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