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Short Communication

Some Pollutants to Defeat to get Clean Drinking Water

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Introduction

The colorants, especially synthetic origin present in waste water, are responsible for many harmful effects to the environment, flora and aquatic fauna. Among the most important effects are the reduction of dissolved oxygen, eutrophication, the formation of recalcitrant and toxic compounds to cells and obstructing the passage of light to the water bodies and aesthetic impairment [1,2]. As an example, red 2 is an azo colorant that may cause intolerance in people who are affected by salicylates. Moreover, it is a histamine liberator, and may intensify symptoms of asthma. It is also involved in cases of hyperactivity in children when used in combination with benzoates. Many countries like the United States have limited their use [3] because it creates problems requiring medical treatment. When azo-type colorants also called Reagent, are dumped into the water bodies produce amines as consequence of the rupture of azo bond, which cause many effects in some human organs such as the brain, liver, kidney, central nervous and reproductive systems [4,5].

Synthetic dyes also affect the photosynthetic activity of some aquifer's plants due to the presence of aromatics, metals, chlorides, etc. [6]. The discovery of synthetic dyes has limited the role of natural dyes due to its characteristics such as low production cost, brighter colors, better resistance to environmental factors and easy application. However synthetic dyes can be often highly toxic and carcinogenic [7]. The dyes have become a major source of severe water pollution as a result of the rapid development of many industries that use them in order to colorize their products [8]. Effects described by pollution of azoic dyes mean a problem that requires attention and treatment. Chemical structure of red 2 or amaranth red E-123 (trisodium 2-hydroxy-1-(4-sulfonato-1-naphthylazo) naphthalene-3-6-disulfonate, molecular weight 604.5 g/mol, and formula $C_{20}H_{11}N_2O_{10}S_3Na_3$ [1]. Effluent discharges of colorant have triggered a great concern for human health and marine life [9].

By this reason, it has been tremendous growth in both the set-up of equipment, corrective facilities, and the development of alternative technologies that respect the environment. Many of these technologies are based on the retention of a contaminant in a solid medium that makes it easy to handle and / or the possible recovery of the material, such as adsorption [10]. One of this material is chitosan. Chitosan molecule exceed valence, which allows them to join colorants and metals [11,12]. Chitosan can be obtained from the partial deacetylation of chitin. At present the chitosan product applications lies primarily in: nutraceuticals, food protectors generally, formulations for cosmetics, medical applications, agricultural uses, feed, flocculation, textiles, pulp and paper. Additionally, application to water purification is in research. Chitosan can be obtained from the partial deacetylation of chitin [13]. Chitin is the second most abundant natural polysaccharide in the nature. Chitosan copolymer is constituted by units $\beta-(1-4)-2$-acetamide-2-deoxy-D-glucopyranose and $\beta-(1-4)-2$-amino-2-deoxy-D-glucopyranose. The former has a molecular weight of 203.2, and formula $C_8H_{13}NO_5$; the latter has a molecular weight of 161.1, and formula $C_6H_{11}NO_4$. When chitosan is dissolved in an acidic medium the amino group is protonated, this fact generates a positive charge, while the azo dyes with sulfonate groups dissolved in water have a negative charge. Therefore, there are groups NH_3^+ and $_{..}O_3S$, which have attracted each other, giving rise to adsorption of azo dyes with sulfonic groups in the chitosan.

The interaction between chitosan (adsorbent) and azoic dye (adsorbate), through their reaction sites NH_3^+ (ion of ammonia from amino group protonated) and $_{..}O_3S$ (sulfur trioxide ion of sulfonate group) respectively, provides the type of existing adsorption [14]. This is done first calculating its geometry optimization, and then building the potential energy surface by fixing NH_3^+ and bringing in $_{..}O_3S$. The reaction among these molecular ions produces sulfamic acid which in zwitterion form $^+H_3NSO_3^-$ is more stable than the neutral acid form H_2NSO_2OH in solid state [15-19]. Physical properties (structural and spectroscopic) and chemical reactions of sulfamic acid have been extensively reviewed [20-22]. The structure of both the zwitterion and neutral form has theoretically been studied previously [23-27]. The neutral case has been studied as an isomer HSO_3NH_2 [14]. It is known the use of ammonia (NH_3) to remove sulfur dioxide (SO_2) [28,29]. Some researchers [30,31] have also worked with interactions and reactions of sulfur trioxide and ammonia not alone. In our case [32], an ion of ammonia $\left(NH_3^+\right)$ in the chitosan adsorbs an azoic dye having sulfonate group through s $..O_3S$.

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