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REMOVAL OF ANIONIC AND CATIONIC DYES WITH BIOADSORBENT OXIDIZED CHITOSANS

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Highlights:

- Oxidized chitosans were developed as novel adsorbents to remove dyes from waste water
- Oxidation introduces carboxyl groups and favors the immobilization of cationic dyes
- The novel adsorbents showed the capacity to remove both anionic and cationic dyes
- The adsorbents can be regenerated and reused for various adsorption/desorption cycles

Abstract

Different oxidized chitosans were prepared following various approaches, by thermo-acid oxidation or by using $\text{KMnO}_4/\text{NaHSO}_3$, $(\text{NH}_4)_2\text{S}_2\text{O}_8/\text{NaHSO}_3$ and $\text{K}_2\text{Cr}_2\text{O}_7/\text{NaHSO}_3$ redox pairs added sequentially or simultaneously. All these reactions pursue the formation of carboxylic groups which enhance their capability to remove model cationic and anionic dyes such as methylene blue and methyl orange, respectively. The resulting oxidized chitosans were structurally and thermally characterized by elemental analysis, infrared spectroscopy, nuclear magnetic resonance, scanning electron microscopy and thermogravimetry. The swelling capacity of these hydrogels was also determined as well as the remediation ability of dyes in different conditions. The results showed that the adsorption of methylene blue followed a pseudo second-order kinetics model, while the adsorption behavior was in agreement with the Langmuir isotherm model. Remarkably, the oxidized chitosans showed removal ability for both dyes cationic and anionic, which of great importance for application of these materials as versatile bioadsorbents.

Keywords: Oxidized chitosans; adsorbent; cationic dyes; anionic dyes; reusability

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