

# CHITOSAN-N-2-HYDROXYPROPYL TRIMETHYL AMMONIUM CHLORIDE USED AS ADSORBENT

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**Abstract:** The chitosan (QTS) has proprieties such as biocompatibility, hydrophilicity and biodegradability, antimicrobial activity, atoxicity, and adsorption<sup>1</sup>. However, these applications are limited to pH conditions due to low solubility at pH above 6, when the chitosan begins to lose its cationic nature<sup>2</sup>. In acid environmental (pH = 3), the protonated amine groups ( $-\text{NH}_3^+$ ) formed along the chain increase the solubility due to polarity increasing and the degree of electrostatic repulsion<sup>3</sup>. However, the free amine groups render several chemical modifications possible in chitosan, rendering the introduction of new functional groups on the polymer matrix, transforming the polymer in quaternary salts<sup>5</sup>. The aim of this work is to prepare the quaternary chitosan salt (QCS) and to use it as a model to the removal of reactive dyes in textile effluents. They were heated to 60°C, 45 grams of glycidyl trimetyl ammonium chloride, 20 grams of chitosan and 200 ml of distilled water maintained under reflux and stirring for 24 hours. The pH was adjusted to 5.4 (HCl, 0.1M), precipitated (acetone), filtered and dried in a heater (50°C for 24hs). Then, the material was cross-linked to 25% for 6 hours, ground and classified (0.212 to 0.053mm). The new material was characterized and the appearance of a new band, in IV,  $1482\text{ cm}^{-1}$  (attributed asymmetrical angular deformation of the quaternary nitrogen methyl groups) 2,291 mmol counterions chlorides/grams of the salt (conductometric titrations) confirmed the formation of a new material from the chitosan modification. The pH independence was tested by the reactive dye RB4 adsorption ( $C_0 = 170\text{ mg L}^{-1}$ , pH 3.4 to 10) in 50mg of the adsorbent, in which the adsorbed quantity of dye remained practically constant ( $q = 122\text{ mg}^{-1}$ ). Tests of equilibrium (50 mg of adsorbent,  $C_0 = 100$  to  $1000\text{ mg L}^{-1}$ , pH 4, 25°C, 240 rpm for 19hs) showed that the Langmuir model provided better correlation with the adsorption capacity,  $q_m = 637\text{ mg g}^{-1}$ . The results showed that quaternary chitosan salt (QCS) can be used as an alternative for the treatment of effluent from the textile industry independent of the pH of the aqueous environment.

## References:

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