# Magnesium oxide modified activated carbon derived from coconut shells for fluoride adsorption

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Fluoride presence in water has been recognized as one of the major global problems, making the development of effective technologies for its removal, within the limits set by WHO (1.5 mg/L) [1], highly important. Therefore, chemical precipitation, ion exchange, membrane process, electrodialysis, coagulation and adsorption are used to eliminate fluoride [2,3]. Among the commonly applied technologies for fluoride removal, adsorption has gained great attention while offers a highly efficient, simple and low-cost treatment. Activated carbon is a common adsorptive material, used for water treatment, due to its significant surface area and porosity. In addition, the modification of activated carbon with the oxides and hydroxides of metals have been used to increase its surface area in order to enhance its interactions with fluoride. Hence, this study was aimed to examine the performance of activated carbon produced from Banana's trees, especially from coconut shells, modified by MgO under specific conditions [4,5], for the removal of fluoride from aqueous solution, while previous studies have proved magnesium (Mg) as a suitable metal source to enhance fluoride removal [6,7].

For AC-MgO synthesis, 5 g of activated carbon derived from coconut shells were mixed with 25 mL metal solution (0.8 g MgO) for 1h at 298 K (25° C) and sonicated for 2 h. The mixture was then rinsed with distilled water and subsequently dried all over night at 333 K (60° C). The sample obtained, was cooled in room temperature in order to be used in adsorption experiments. The structure and the morphology of modified activated carbon (AC-MgO) were studied in detail by the application of FTIR, BET and SEM characterization techniques.

Furthermore, the proposed adsorbent material applied for the treatment of simulated contaminated with fluoride water. The effects of the adsorbent's dosage, pH value, and experimental/operational conditions efficiency, were examined. According to the obtained results, the maximum adsorption was observed at pH 8, 3 h as contact time and 0.2 g/L of adsorbent dose. Langmuir, Freundlich isotherm (Fig. 1 (a)) and pseudo-second kinetic models (Fig. 1 (b)) fitted the experimental data sufficiently. The maximum adsorption capacity was 13.56 mg/g.

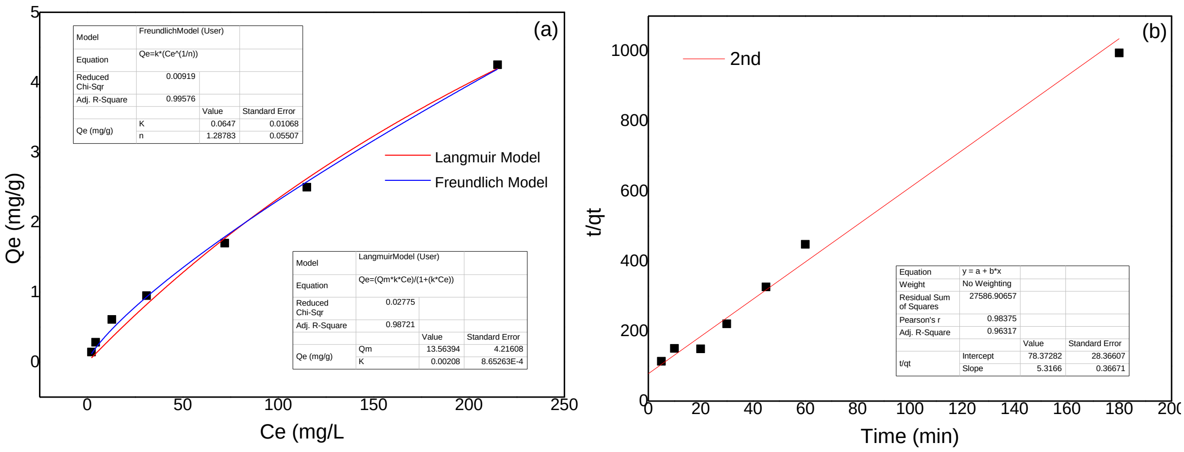


**Fig. 1. (a)** Langmuir and Freundlich adsorption isotherms; **(b)** pseudo-second-order kinetics model diagrams for fluoride adsorption onto AC-MgO adsorbent, pH=8, T=298K, dosage 0.2 g/L.

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