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## STUDY OF Cd (II) AND Cr (VI) BIOSORPTION BY MESOCARPS OF ORANGE AND SOUR ORANGE FROM AQUEOUS SOLUTIONS

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### Abstract

The objectives of this study were to investigate of cadmium and chromium adsorption from aqueous solutions by using orange (*Citrus sinensis* var. Tampson) and sour orange (*Citrus aurantium*) mesocarp. The chemometric approach was applied for the optimization of removal percent of Cd<sup>2+</sup> and Cr<sup>6+</sup>. To optimize Cd<sup>2+</sup> and Cr<sup>6+</sup> removal percent, the effect of four experimental parameters on removal percent was investigated by means of multivariate analysis. The considered factors were Cd<sup>2+</sup> and Cr<sup>6+</sup> concentrations, adsorbent concentration, pH and contact time. The experiments were performed according to a Box-Behnken design (BBD). Then obtained removal percent were fitted to a polynomial model. The regression models were characterized by both descriptive and predictive ability ( $R \geq 0.89$ ,  $R_{CV} \geq 0.80$ ). The models revealed that the main effects and quadratic order of four factors were significant on adsorption of Cd<sup>2+</sup>. Two-factor interactions with different orders and third order term of some factors had also significant effect on the adsorption of Cr<sup>6+</sup>. Validity of the method used in the present study was confirmed as good agreements between the predicted and experimentally was observed in the optimized conditions. The results showed that the maximum removal efficiency by both mesocarps was the same and about 100 % for heavy metals. The results of FT-IR spectra showed that the most functional groups in two adsorbents are: OH (hydroxyl), C=O (carboxyl) and carboxylate groups. Therefore, orange and sour orange mesocarp have a good ability to remove heavy metal from the aquatic environment.

*Key words:* biosorption, experimental design, heavy metals, orange wastes, sour orange

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