

STARCH ACETATE SORBENTS FOR REMOVAL OF PARABENS FROM AQUEOUS MEDIUM

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Current lifestyle has led to the extensive usage of cosmetic and personal care products (CPCPs) all over the world. The occurrence of CPCP residues in domestic sewage, municipal wastewater and wastewater treatment systems is inevitable. The monitoring results showed their ambient accumulation exhibiting an increasing trend during the recent years. Parabens can be used in various CPCPs as preservatives, also they are quite easy to be used at industrial scale. However, parabens are great danger to ecosystem due to their potential toxicity, estrogen-mimicking and carcinogenic properties [1]. These complications create a need for search for new ways to additionally eliminate those contaminants.

In this study the synthesized microgranular starch acetates (SA) have been tested as a potential sorbents for removal of alkyl parabens from aqueous medium.

The adsorption of alkyl parabens, namely methylparaben (MP), ethylparaben (EP) and propylparaben (PP), on SA microgranules in water has been investigated by employing the equilibrium adsorption method. It was found that adsorption of parabens on SA proceeded rapidly during the first 10 min (see Fig. 1A). The obtained isotherms of methyl-, ethyl- and propylparabens adsorption on SA at 20 °C are presented in Fig. 1B.

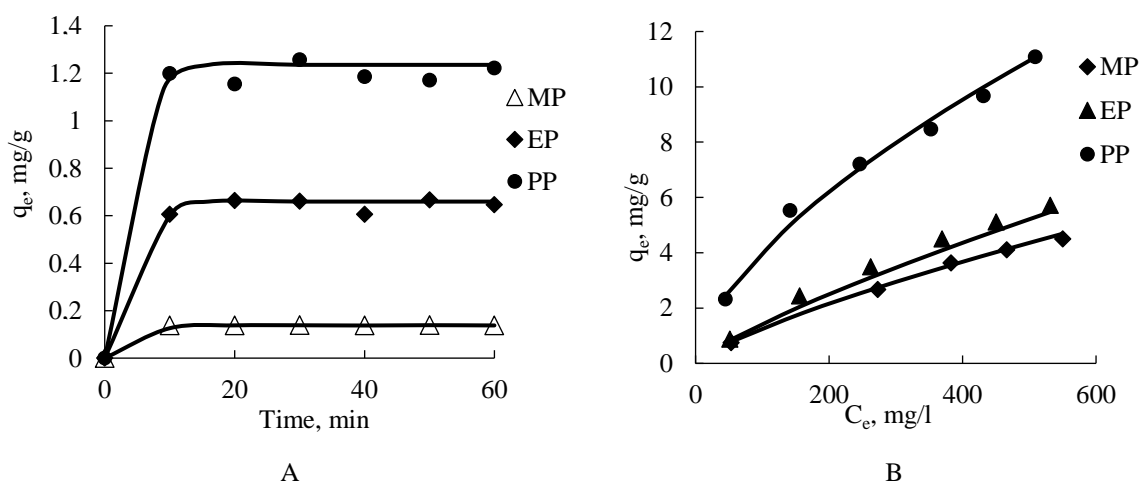


Fig. 1. Adsorption kinetics (A) and isotherms (B) of alkyl parabens on SA at 20 °C. Symbols represent experimental data and the lines represent fitted curves of the Langmuir adsorption model in (B)

The Langmuir, Freundlich and Dubinin–Radushkevich adsorption models were used to describe the adsorption isotherms and the main parameters of adsorption models such as the Langmuir sorption capacity (Q_L), the Freundlich constant (n_F) and the Dubinin-Radushkevich adsorption energy (E_{DR}) values were calculated and revealed that adsorption occurred due to physical forces. The Langmuir sorption capacity Q_L was increasing by increasing the length of alkyl chain in paraben molecule, in the following order: propylparaben > ethylparaben > methylparaben. To summarize, SA granules can be promising adsorbent for the removal of parabens from aqueous medium.

References

1. C. Haman et al., Occurrence, fate and behavior of parabens in aquatic environments: A review: Water Research 68, 1-11 (2015)