supplementary materials

Experimental data of adsorption kinetics

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Adsorption Capacity and Removal Rate of Different Adsorbents

When the adsorbent dose was 0.06 – 0.5 g / L, with the decrease of CR solution volume, the adsorption capacity decreased from 1208.873 mg / g to 867.241 mg / g, and the removal rate increased from 20.642 % to 94.475 %. When the adsorbent mass is constant, the increase of dosage represents the decrease of dye solution volume, and the number of active sites of the adsorbent remains unchanged. However, the number of dye molecules in the solution is decreasing, and the active sites of the adsorbent cannot be fully occupied. Therefore, with the increase of dosage, the removal rate of CR increases, but the adsorption capacity decreases. When the dosage is less than 0.333 g / L, the adsorption capacity decreases sharply with the decrease of CR solution volume. Although the removal rate of CR is still increasing, the increase is small. This is because when the volume of CR solution is small, at the initial stage of adsorption, the dye molecules in the solution quickly occupy the adsorbent site. At the later stage of adsorption, due to
the low concentration of the remaining dye molecules in the solution, the binding efficiency with the adsorbent site decreases, resulting in a decrease in the adsorption amount.

20 mL of 0.01 mol/L sodium chloride solution was taken and put into a series of conical flasks. The pH (denoted as $p_{Hi}$) was adjusted to be between 2 and 11, and 10 mg of CEHP-2 was added and oscillated at constant temperature of 313 K for 12 h. The pH (denoted as $p_{Hf}$) of the solution at this time was determined, and the $p_{Hi}$ was plotted with $\Delta pH (p_{Hi} - p_{Hf})$. The intersection of the two was the zero charge point of the adsorbent. Under $\Delta pH$, the adsorbent surface has positive charge, while above $\Delta pH$, the adsorbent surface has negative charge. However, the adsorption mechanism depends not only on $\Delta pH$, but also other factors that affect the adsorption of species on adsorbents. $pH = 9.39$ is zero charge point.