C2 : Organic matter removal by adsorption on GAC

1. Principle

A solution of COD = 200 mgO$_2$ / L is prepared with resorcinol C$_6$H$_6$O$_2$; this is our raw water.
With the Jar test technique, different concentrations of GAC (0 to 20g / L) are tested in order to remove COD by adsorption.
This experiment can be carried out by changing the type of GAC, the GAC or COD concentrations, the time of contact…
An Freudlich isotherm is established.

2. Procedure

2.1. Write the oxidation reaction between resorcinol and dioxygen.
 Prepare 1 litre of resorcinol mother solution which COD = 2000 mgO$_2$ / L ;
Answer : prepare a solution of 1.056 g / L
Verification : carry out the determination of this mother solution COD (dilute it 10 times)

2.2. Fill each flask of a Jar test with 800 mL of raw water : with a graduated cylinder, add 80 mL of DCO 2000 and 720 mL of deionised water : here you have, in each flask, 800 mL of a raw water which COD = 200 mgO$_2$/L
Add 0, 1, 5, 7 and 20 g of GAC / litre in the flasks.
Mix for 30 min at 45 rpm
Lift up the paddles
Remove GAC in each flask by filtration with a fold paper filter and a funnel.

2.3 . Carry out the determination of the residual COD in each flask.

3. Report

3.1. Explain the preparation of the mother solution
Indicate measured value of its COD (indicating the Mohr's salt poured volumes).

3.2. Indicate the values of each residual COD.

3.3. Calculate, for each flask, the COD adsorbed per one gram of GAC :

$$\text{COD adsorbed (mg O}_2 / \text{g}_{gac}) = \frac{\text{Adsorbed COD (mgO}_2 / \text{L)}}{\text{GAC concentration (g/L)}}$$

- Plot : COD adsorbed (mg O$_2$ / g $_{gac}$) = f (residual COD) : this is the isotherm of adsorption.

- the standard regulation of disposal for the treated water is COD =60 mg O$_2$ / L
 Determinate the conditions ,i.e. the concentration of GAC, allowing to respect this standard .