



# The adsorptive treatment of methylene blue from aqueous solution by spent coffee grounds

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## ABSTRACT

The results obtained from using SCG as an adsorbent for the methylene blue (MB) adsorption were evaluated through the following investigations. The experiment investigating the stirring time found that the stirring time for adsorption to equilibrium was 150 min. Maximum adsorption capacity was 63.29 mg/g. The adsorption process followed the Langmuir isothermal adsorption. MB could be desorbed by adjusting the pH to 2.

## INTRODUCTION

Spent coffee grounds (SCG), a type of food waste that has been realized to have many different uses (as a fertilizer for plants, a raw material for the biodiesel production, a source for the activated carbon synthesis, or an adsorbent for water and wastewater treatments). The use of SCG as a Methylene Blue (MB) adsorbent from aqueous solutions is considered effective at low cost, safe and easy to operate.

## MATERIALS & METHODS

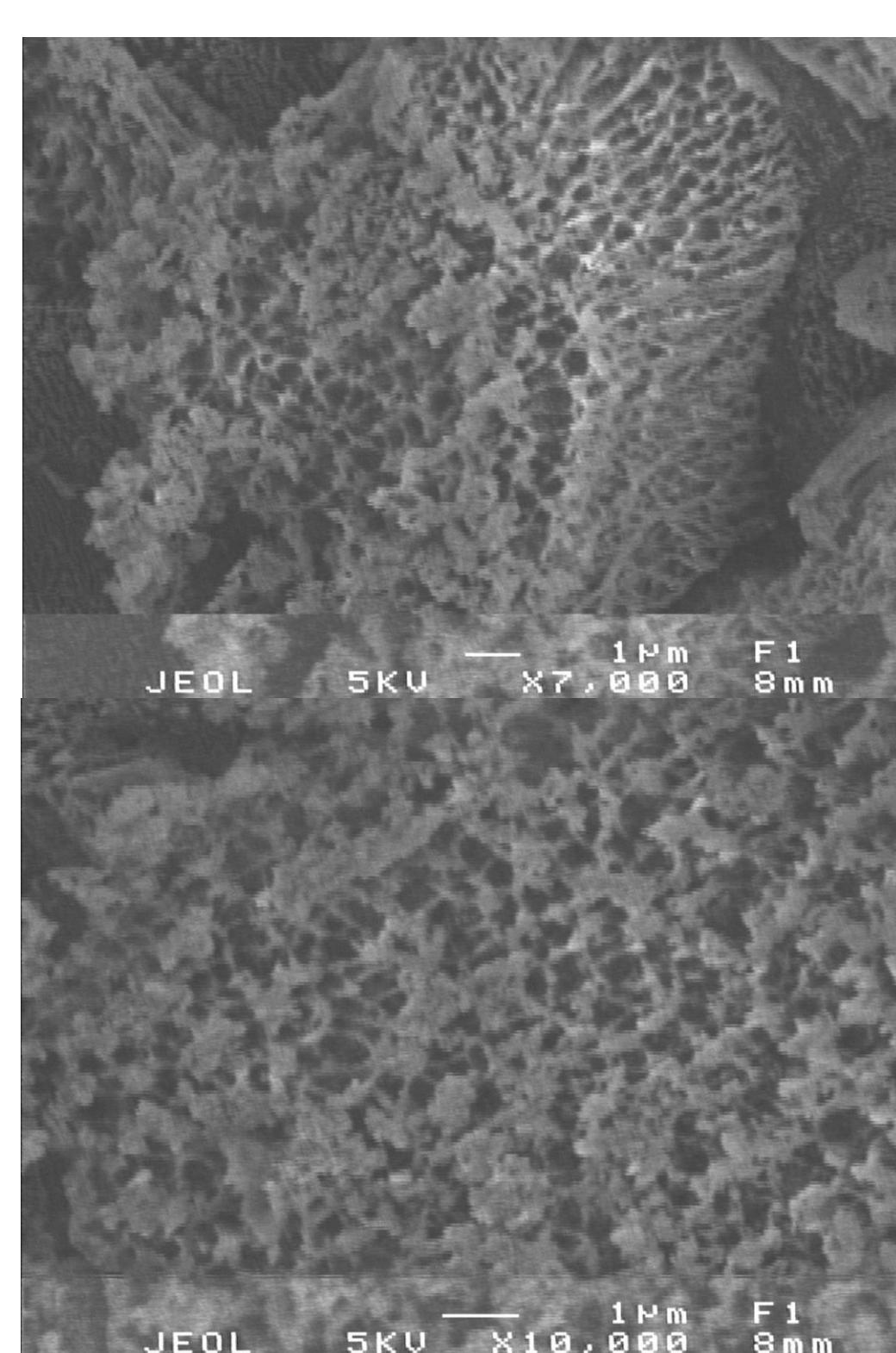
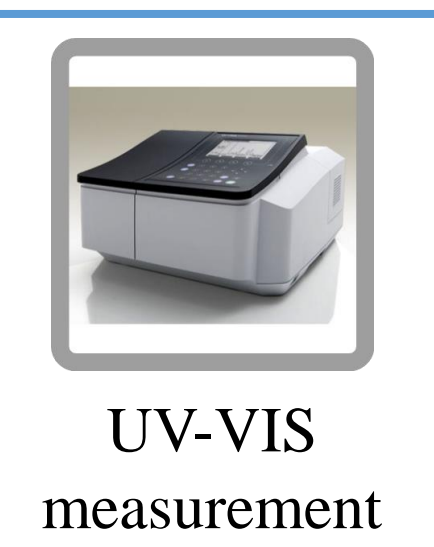


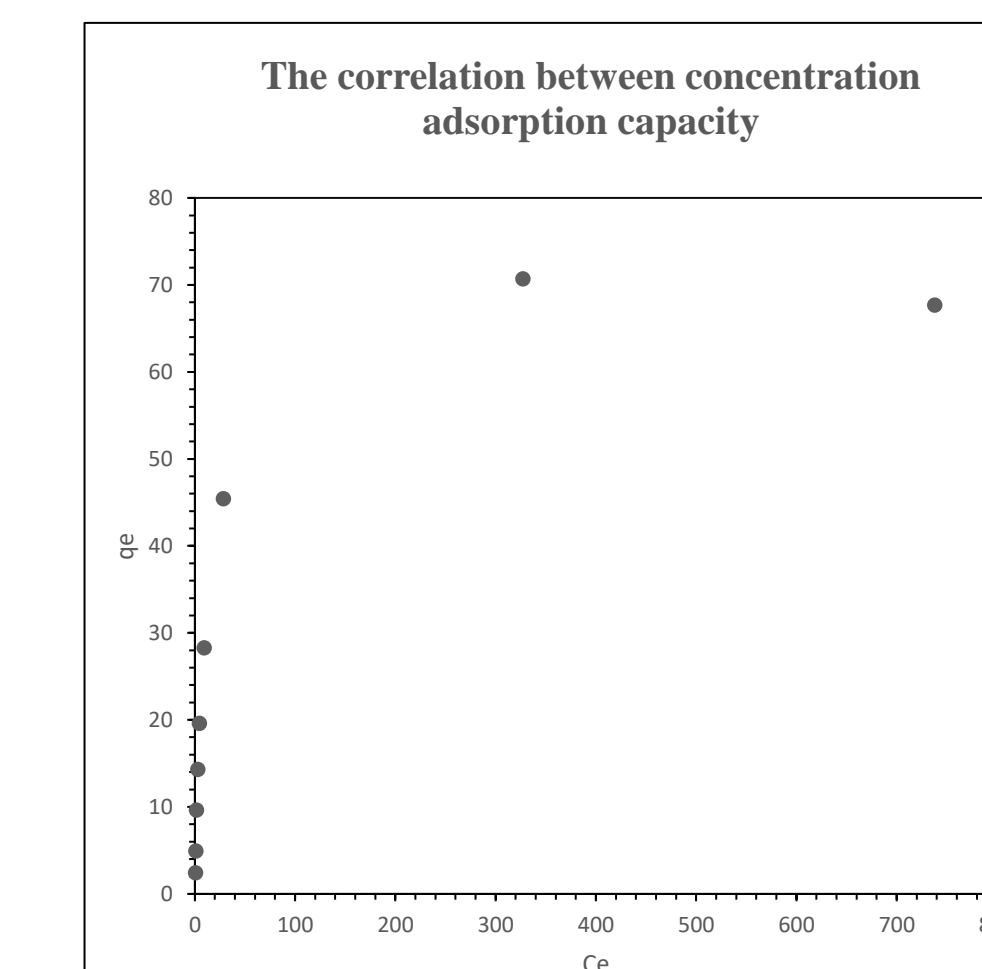
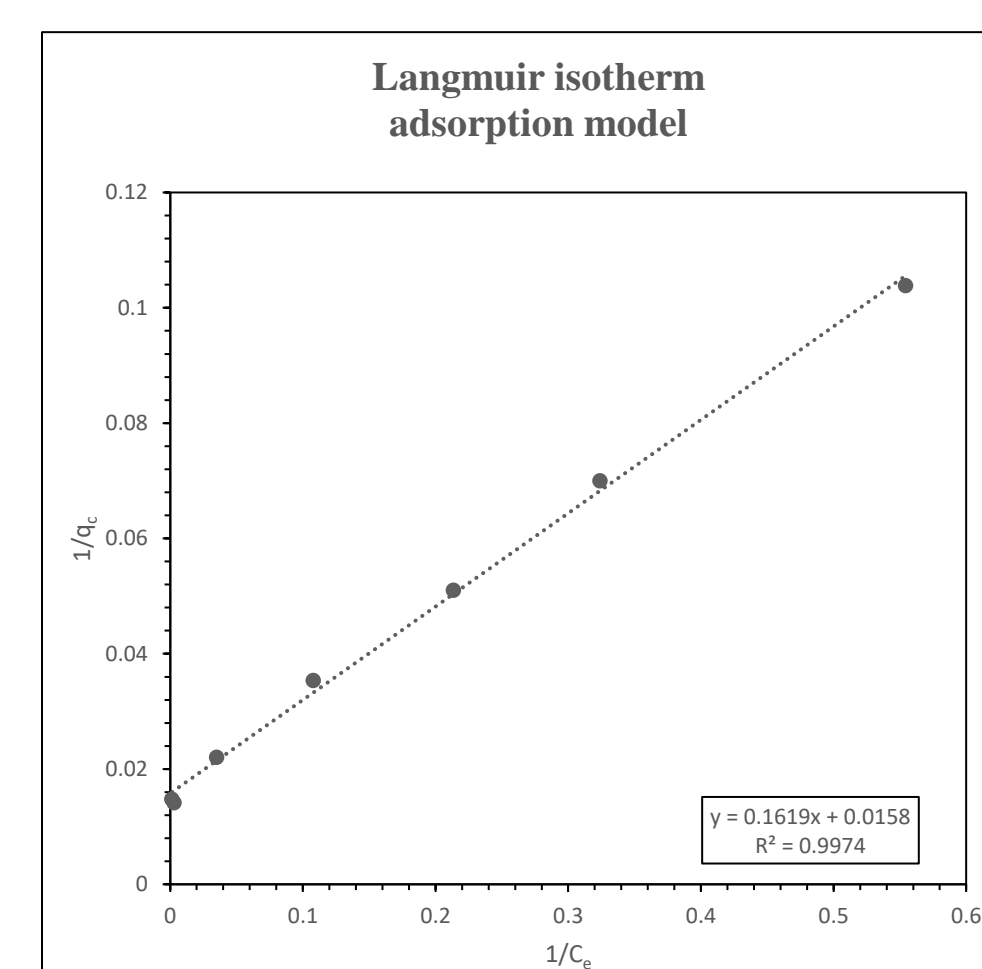
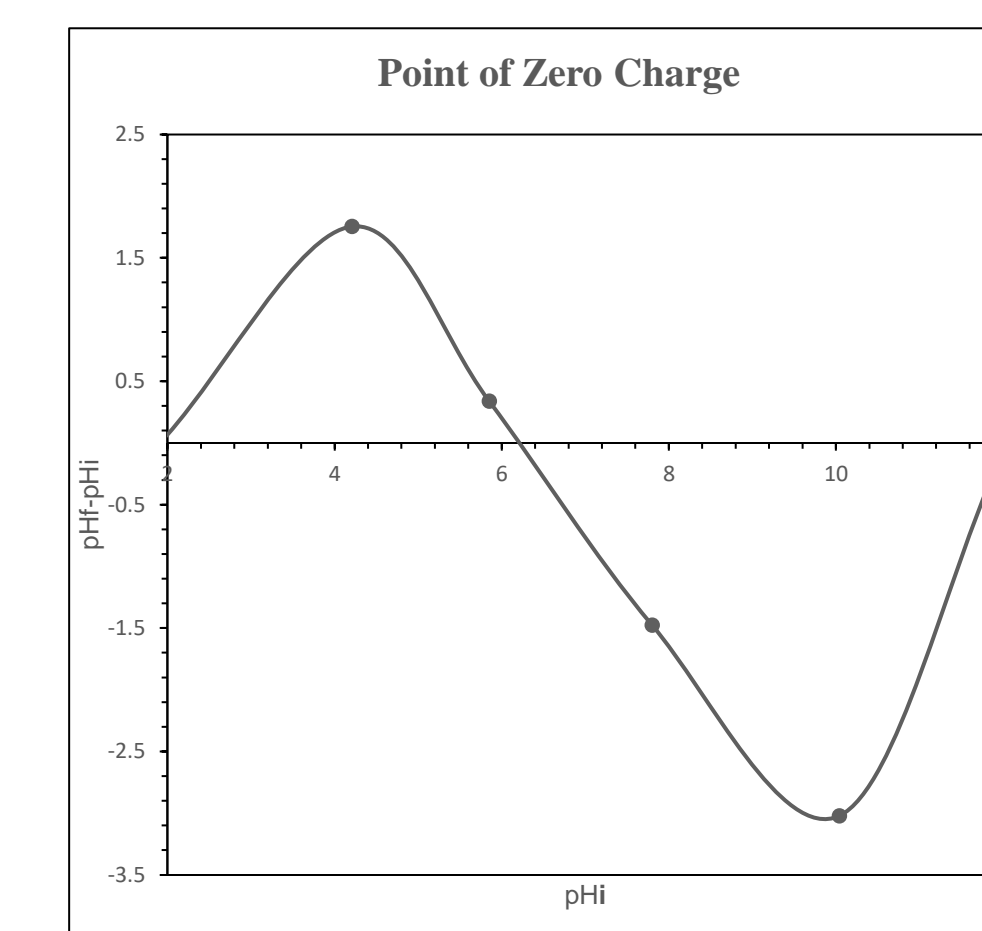
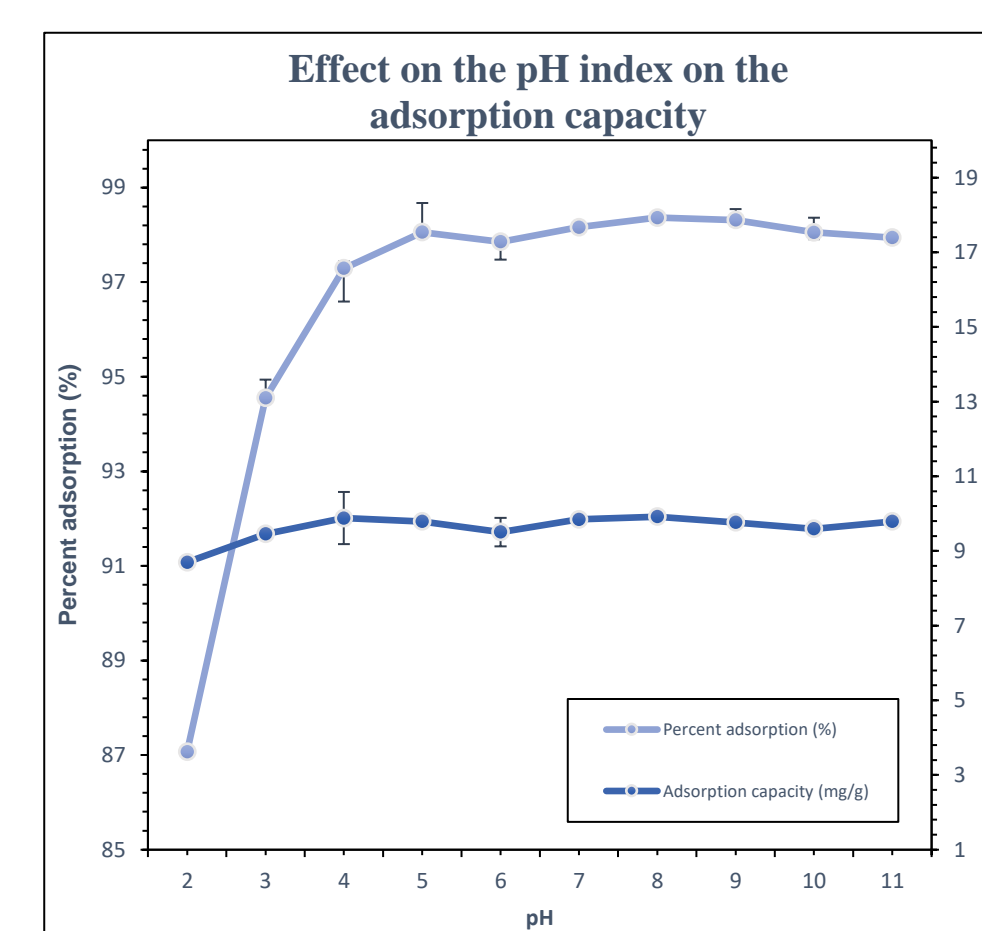
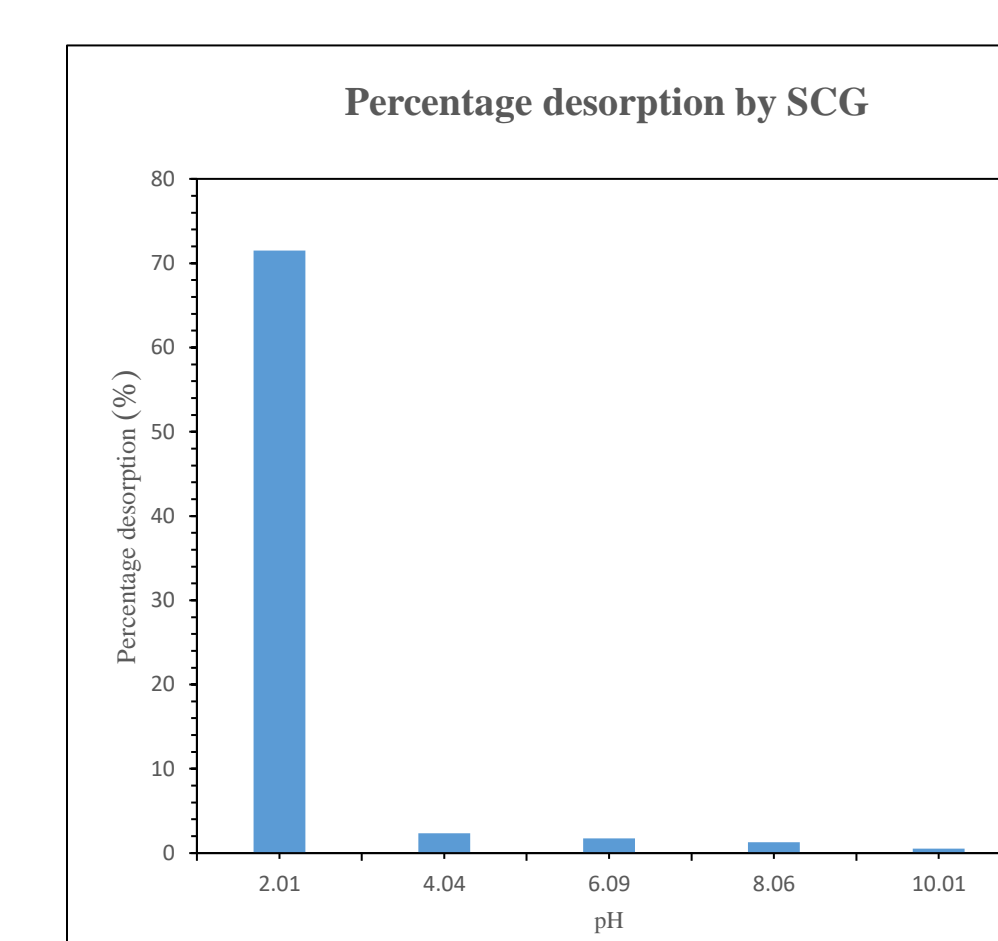
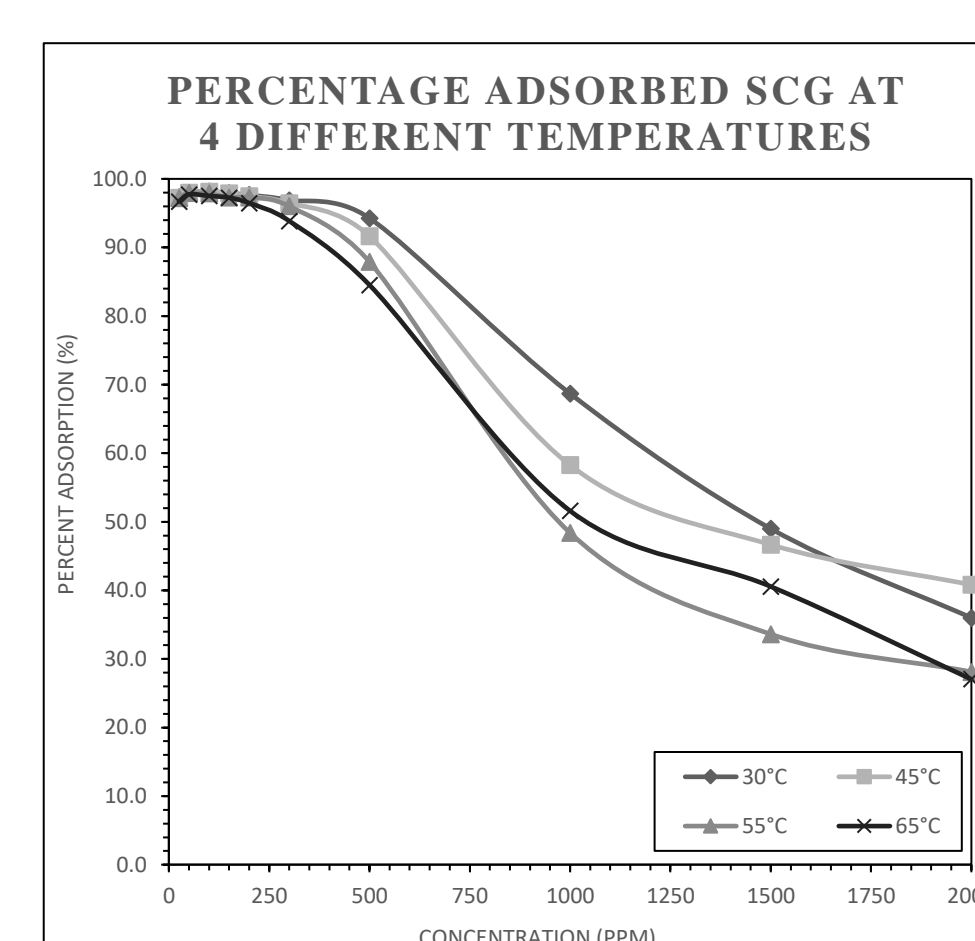
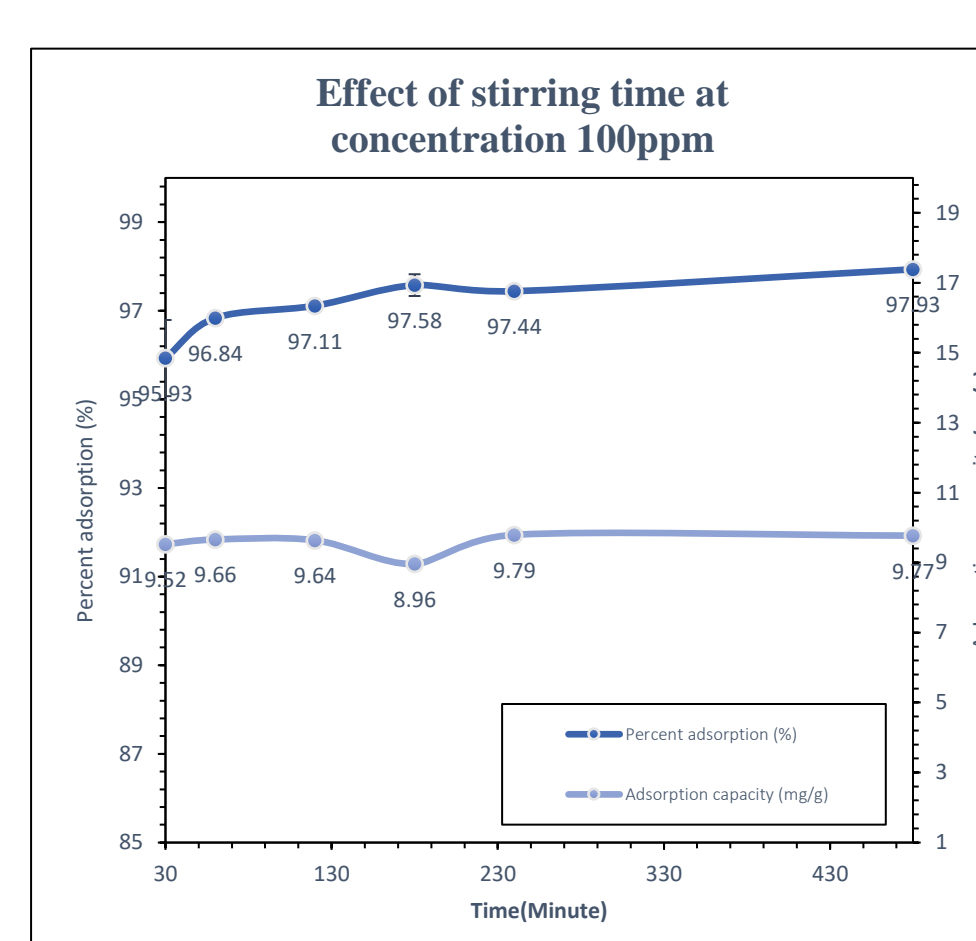
Figure 1: SEM images of Surface Spent Coffee Ground

- Figure 1 showed that the surface of SCG is spongy.
- Specific Surface Area:  $\sim 19 \text{ m}^2/\text{g}$ .
- SCG was treated at  $60^\circ\text{C}$  for 48 hours prior to testing.



- The main materials used were SCG & MB.
- MB at different concentrations from 25 ppm - 2000 ppm.
- The stirring time was changed from 30, 60, 120, 180, 240, 480 minutes.
- The pH of the solution was adjusted from 1-12 depending on the experiment.

## RESULTS



## DISCUSSIONS

- The optimum adsorption time of SCG was 150 minutes.
- Langmuir isotherm model was suitable to describe the adsorption process of SCG.
- The optimal pH adsorption of SCG was pH = 5.
- The adsorption process was exothermic ( $\Delta H^\circ < 0$ ).
- The desorption process was effective at pH 2.

## REFERENCES

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## CONCLUSIONS

### Agricultural adsorbents

Adsorbent type	Amount adsorbed
Banana peel	18.647 mg/g
Potato peels	33.55 mg/g
Melon peel	333.33 mg/g
Cucumber peel	111.11 mg/g
Coffee ground	63.29 mg/g

The results revealed the potential of spent coffee ground to be a low-cost, non-toxic and biocompatible adsorbent for removing basic dye from aqueous solution. Compared with some adsorbents derived from food waste, the adsorption capacity of spent coffee grounds is relatively good.