

## **Supporting information**

### **Hydrothermal synthesis of magnetic-biochar nanocomposite derived from avocado peel and its performance as an adsorbent for the removal of methylene blue from wastewater**

Eswaran Prabakaran<sup>a</sup>, Kriveshini Pillay<sup>b</sup>, Hendrik Brink<sup>a\*</sup>

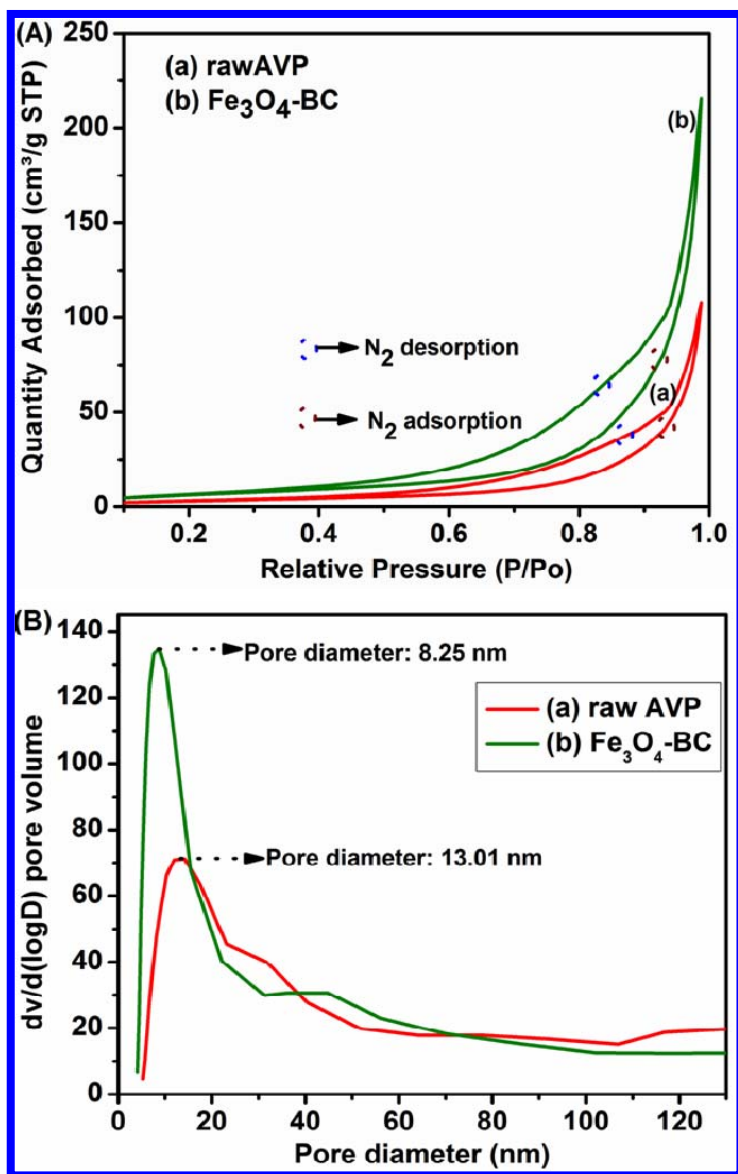
*<sup>a</sup>Department of Chemical Engineering, Water Utilisation and Environmental Engineering Division, University of Pretoria, Pretoria, South Africa.*

*<sup>b</sup>Department of Chemical Sciences, University of Johannesburg, Doornfontein Campus, Johannesburg, 2028, South Africa.*

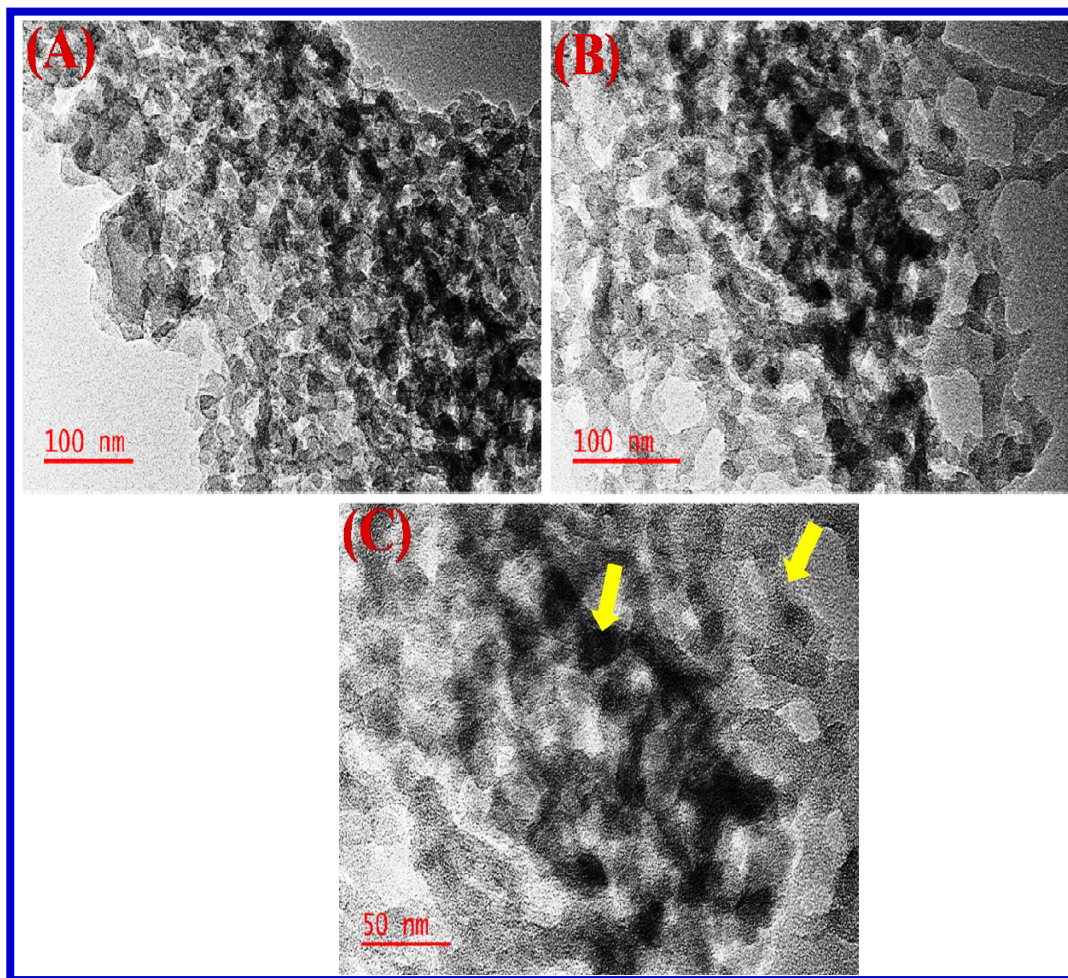
---

\*Corresponding author: Tel: 012 420 3569

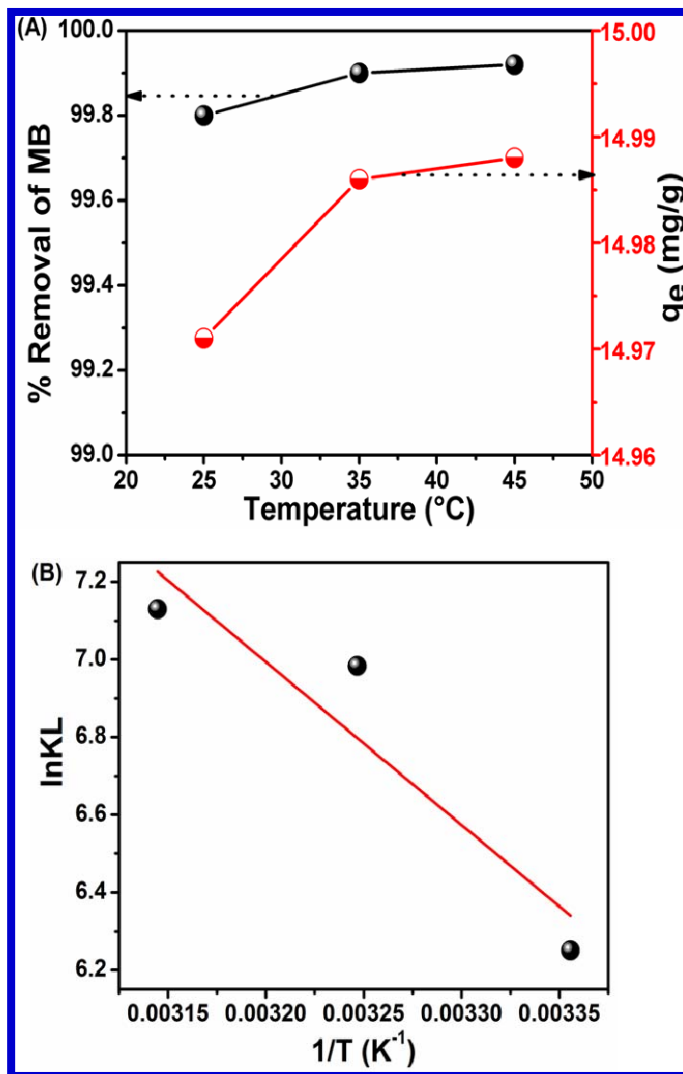
Email address: [deon.brink@up.ac.za](mailto:deon.brink@up.ac.za)



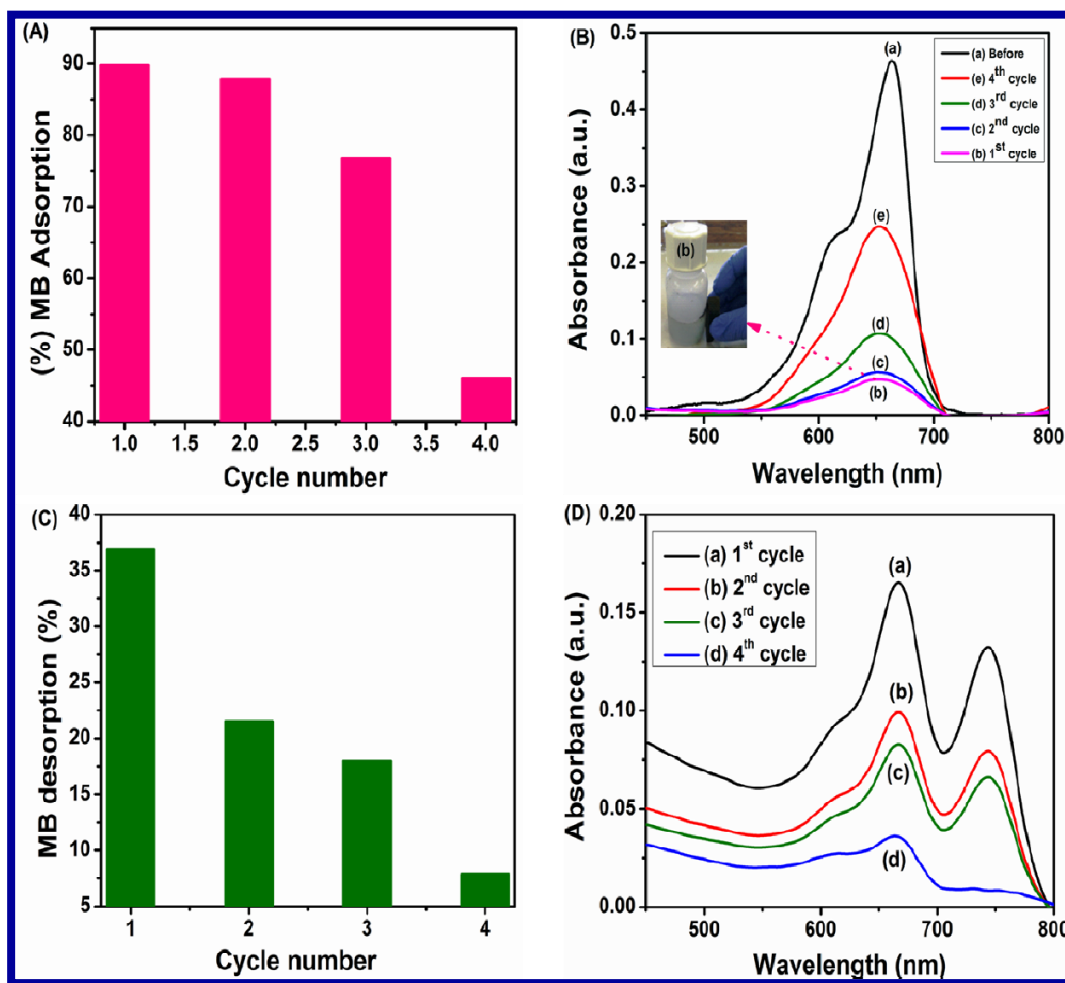
**Figure S1 (A&B).** (A) Nitrogen adsorption-desorption isotherms (a) raw AVP and (b) Fe<sub>3</sub>O<sub>4</sub>-BC nanocomposite and (B) Pore diameter of (a) raw AVP and (b) Fe<sub>3</sub>O<sub>4</sub>-BC nanocomposite.



**Figure S2 (A-C).** TEM images of Fe<sub>3</sub>O<sub>4</sub>-BC nanocomposite (A) 100 nm, (B) 100 nm and (C) 50 nm.



**Figure S3 (A&B).** (A) Effect of temperature of 298 K, 308 K and 318 K and (B) Enthalpy and entropy evaluation for the adsorption of MB with Fe<sub>3</sub>O<sub>4</sub>-BC nanocomposite.



**Figure S4 (A-D).** (A) Reusability -percentage of adsorption of MB versus cycle number, (B) UV-visible spectra of MB adsorption onto Fe<sub>3</sub>O<sub>4</sub>-BC nanocomposite after four cycles and digital image of magnetically separated adsorbent (inset), (C) Percentage of desorption of MB versus cycle number and (D) UV-visible spectra of MB desorption from surface of Fe<sub>3</sub>O<sub>4</sub>-BC nanocomposite with Ethanol and HCl with four cycles.

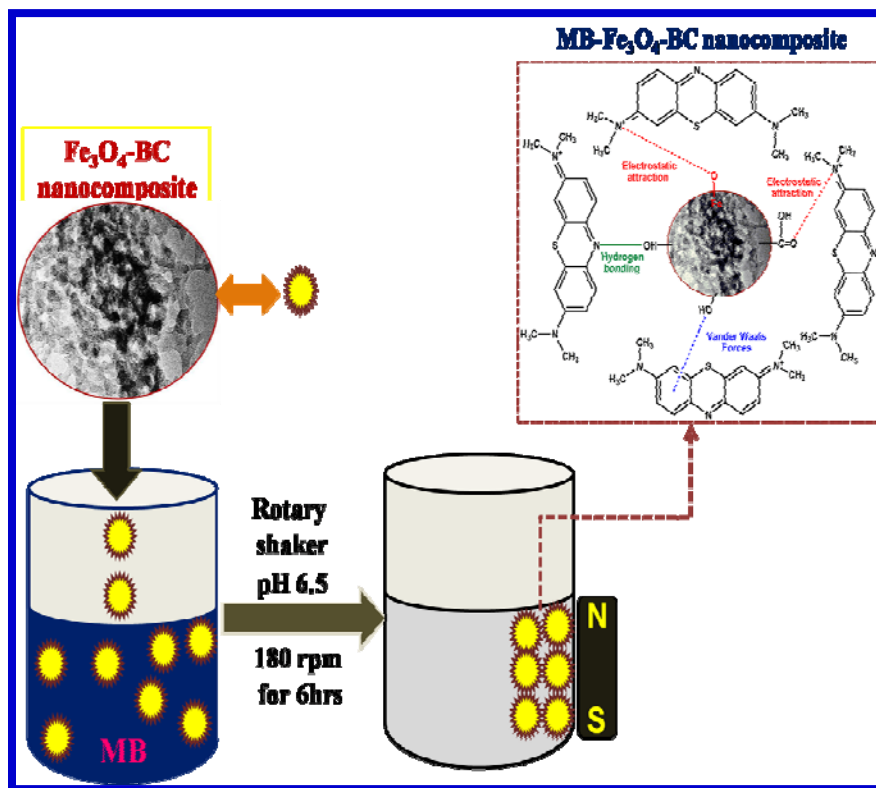
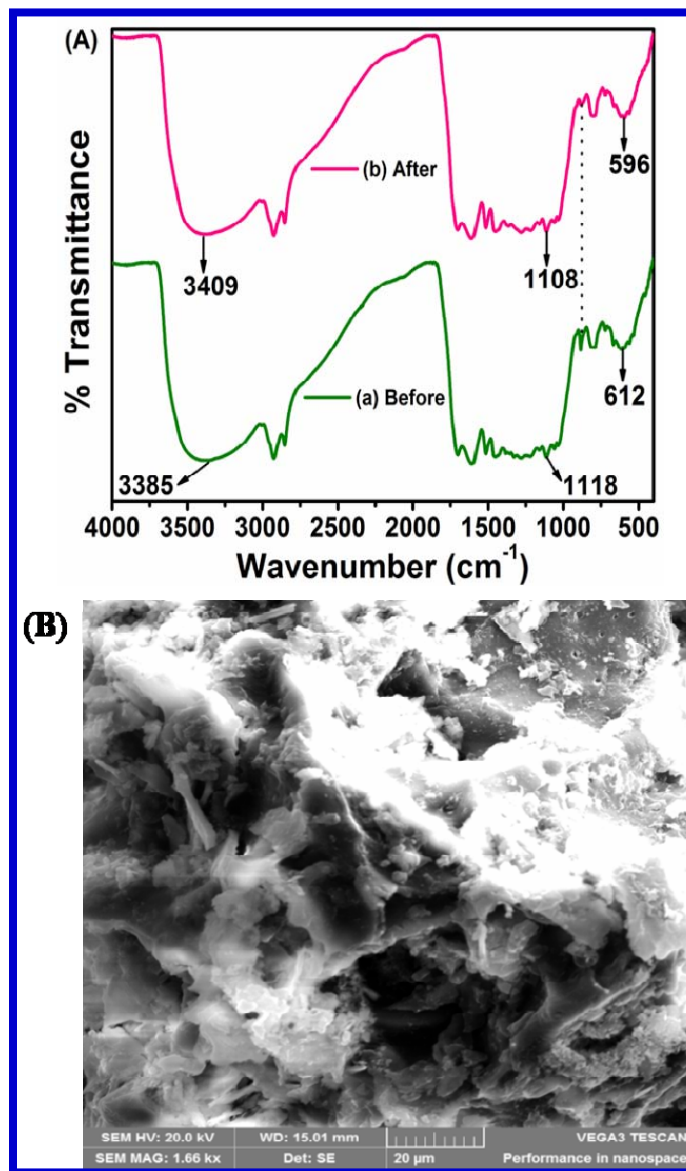


Figure S5. Mechanism of MB adsorption onto Fe<sub>3</sub>O<sub>4</sub>-BC nanocomposite.



**Figure S6 (A&B).** FT-IR spectra of before and after adsorption of MB with Fe<sub>3</sub>O<sub>4</sub>-BC nanocomposite and (B) SEM images of after adsorption MB onto Fe<sub>3</sub>O<sub>4</sub>-BC nanocomposite with 20 μm magnification.