**Supplementary Information - Figures**

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| (a) | (b) |

Fig. 1 3D surface plot of MB removal response for (a) effect of radiation power and radiation time and (b) effect of radiation time and IR

|  |  |
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| (a) | (b) |

Fig. 2 3D surface plot of AWAC’s yield response for (a) effect of radiation power and IR and (b) effect of radiation time and IR

**Supplementary Information - Equations in manuscript**

where WKOH is the weight of KOH pellet and WCHAR is the weight of the char.

where Wf and Wi are dried weight of AWAC and dried weight of precursor, respectively.

where Y is the predicted response, *b0*, *bi*, *bij* and *bii* are the constant coefficient, linear coefficient, interaction coefficient and quadratic coefficient, respectively, *xi* and *xj* are the coded values of the AWAC preparation variables and *ei* is the error.

where Co and Ce are the concentration of MB dye initially and at equilibrium, respectively; V is the volume of solution (L), and W is the weight of AWAC used (g).

Langmuir (Langmuir, 1918):

Freundlich (Freundlich, 1906):

Temkin ([Temkin](#_4f1mdlm) and Pyzhev):

Dubinin-Radushkevich (Redlich and Peterson, 1959):

where Qm is maximum adsorption capacity; KL is the constant of Langmuir; KF and nF are constants of Freundlich; B and A are constants of Temkin, qDR is the adsorption capacity, R is the universal gas constant, T is temperature and ɛ is free energy.

Pseudo-first order (PFO) (Lagergren, 1898):

Pseudo-second order (PSO) ([Ho](#_3tbugp1) and McKay, 1999)

Elovich ([Aeenjan and Javanbakht 2017](#_28h4qwu)):

Intraparticle diffusion ([Boopathy et al. 2013](#_nmf14n)):

Boyd plot ([Islam et al. 2017](#_17dp8vu)):

where k1 is rate constant for PFO, k2 is rate constant for PSO, α is sorption constant of adsorbate, β is constant of desorption, kt,i is rate constant for intraparticle diffusion.

where qe,cal is the calculated MB uptake and qe,exp is the experimental MB uptake.

where ΔH° is the enthalpy change (kJ mol-1), ΔS° is the entropy change (kJ mol-1 K-1), ΔG° is the Gibbs free energy (kJ mol-1).

where [adsorbate]° and *ϒ* are the standard concentration of the adsorbate, which concentration by definition is 1 mol/L at standard conditions and coefficient of activity of the adsorbate (dimensionless), respectively.