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Fabrication of granular activated carbons derived from spent coffee grounds by entrapment in calcium alginate beads for adsorption of acid orange 7 and methylene blue

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1 **Fabrication of granular activated carbons derived from spent coffee**
2 **grounds by entrapment in calcium alginate beads for adsorption of**
3 **acid orange 7 and methylene blue**

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12 **Abstract**

13 Biomass-based granular activated carbon was successfully prepared by entrapping
14 activated carbon powder derived from spent coffee grounds into calcium-alginate beads
15 (SCG-GAC) for the removal of acid orange 7 (AO7) and methylene blue (MB) from
16 aqueous media. The dye adsorption process is highly pH-dependent and essentially
17 independent of ionic effects. The adsorption kinetics was satisfactorily described by the
18 pore diffusion model, which revealed that pore diffusion was the rate-limiting step
19 during the adsorption process. The equilibrium isotherm and isosteric heat of adsorption
20 indicate that SCG-GAC possesses an energetically heterogeneous surface and operates
21 via endothermic process in nature. The maximum adsorption capacities of SCG-GAC
22 for AO7 (pH 3.0) and MB (pH 11.0) adsorption were found to be 665.9 and 986.8 mg/g
23 at 30 °C, respectively. Lastly, regeneration tests further confirmed that SCG-GAC has

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