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Short Communication

Synthesis and Characterisation of slow pyrolysis Pine Cone bio-char in the removal of organic and inorganic pollutants from aqueous solution by adsorption: Kinetic, equilibrium, mechanism and thermodynamic

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1 **Synthesis and Characterisation of slow pyrolysis Pine Cone bio-char in**
2 **the removal of organic and inorganic pollutants from aqueous solution**
3 **by adsorption: Kinetic, equilibrium, mechanism and thermodynamic**

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11 **Abstract**

12 Pine cone bio-char was synthesised through slow pyrolysis at 500°C, characterized and
13 used as an effective adsorbent in the removal of organic Methylene Blue (MB) dye and
14 inorganic nickel metal (Ni(II) ions from aqueous phase. Batch adsorption kinetic study
15 was carried out by varying solution pH, dye concentration, temperature, adsorbent dose
16 and contact time. Kinetic and isotherm models indicates that the adsorption of both
17 adsorbates onto pine cone bio-char were mainly by chemisorption. Langmuir maximum
18 adsorption capability was found to be 106.4 and 117.7 mg/g for methylene blue (MB)
19 and nickel ions (NI(II) respectively. Thermodynamic parameters suggested that the
20 adsorption was an endothermic and spontaneous. These results indicate the applicability
21 of pine cone as a cheap precursor for the sustainable production of cost-effective and
22 environmental friendly bio-char adsorbent.

23 **Keywords:** Bio-char, pine cone, Methylene Blue, nickel, adsorption.

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