Surface Modification of Date Palm Activated Carbonaceous Materials for Heavy Metal Removal and CO2 adsorption

A. Bumajdad\* and P. Hasila

Chemistry Department, Faculty of Science, Kuwait University, P.O. Box 5969, Safat 13060, Kuwait

\* Corresponding Author: Ali Bumajdad ([a.bumajdad@ku.edu.kw)](mailto:a.bumajdad@ku.edu.kw))

**3. Results and Discussion**

3.1 Structural Properties

*Electron Microscopy Analysis*

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**Figure S1.** SEM micrographs of Urea enriched Pa-K2CO3 AC before (a,b) and after (c,d) adsorption and that of urea enriched Pa-Cs2CO3 AC before (e,f) and after (g,h) adsorption for Pb (II).

*X-Ray Diffraction*

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**Figure S2**. XRD patterns of Ps-ACs activated with K2CO3 before (not enriched) and after functionalization (N-enriched).

3.2 Thermal Analysis

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**Figure S3.** TGA curves of (a) raw palm samples where upper curve (L) for leafy part and lower curve (S) for stem part and (b) different N enriched Ps-ACs activated with K2CO3.

3.4. Identification of Functionalities

*FTIR and Raman*

Diagram

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**Figure S4.** Raman spectra of the indicated samples.

3.5 Quantitative assessment of acid surface functional groups - Boehm titrations

**Chart, histogram

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**Chart, histogram

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**Figure S5.** Potentiometric (a) and first derivative curve (b) of the titration. The activating agent is Cs2CO3.

3.7.4 Thermodynamics of Lead Adsorption

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**Figure S6.** The thermodynamic plot for adsorption of Pb(II) on to Ps-Cs2CO3 enriched by Urea at varying initial concentrations (10-80 ppm).