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Title: Preparation of diamine modified mesoporous silica on multi-walled carbon nanotubes for the adsorption of heavy metals in aqueous solution

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1 **Preparation of diamine modified mesoporous silica on**
2 **multi-walled carbon nanotubes for the adsorption of**
3 **heavy metals in aqueous solution**

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10 **Highlights**

11 Diamine modified mesoporous silica on MWCNTs was firstly synthesized.

12 The prepared adsorbent was characterized by various instrumental methods.

13 The adsorption process using Cu (II) as a model was thoroughly investigated.

14 This new adsorbent showed excellent adsorption efficiency for heavy metals.

15
16 **Abstract**

17 An effective adsorbent of diamine functionalized mesoporous silica on
18 multi-walled carbon nanotubes (NN-mSiO₂@MWCNTs) has been prepared to remove
19 heavy metals in aqueous solution. Structural characterization was conducted by
20 Fourier transform infrared spectroscopy (FT-IR), transmission electron microscopy
21 (TEM), N₂ adsorption-desorption measurement and X-ray diffraction (XRD), which
22 confirmed the successful grafting of organic moiety on mSiO₂@MWCNTs. Metals
23 removal from aqueous solution was examined for Cu (II), Ni (II), Pb (II) and Zn (II).
24 In addition, Cu (II) adsorption process was thoroughly studied from both kinetic and
25 equilibrium points of view. Adsorption kinetics could be well described by

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