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Adsorption of formaldehyde-(2,4 dinitrophenylhydrazine) onto carbon nanotubes and quartz sand

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Formaldehyde (FA) is one of the most commonly found organic chemical compounds in the environment. The HPLC based analytical determination of FA is achieved through derivatization reaction of FA with 2,4-dinitrophenylhydrazine (DNPH) reagent. This is a yellow derivative, which can be observed spectrophotometrically. Because HPLC is a widely applied analytical separation and quantification technique, large quantities f produced hazardous wastes could easily be released in the environment, with subsequent ground water contamination. This study focused on the interaction of FA-(2,4- DNPH) with multi-walled carbon nanotubes (MWCNTs) and quartz sand under static and dynamic conditions. Several batch adsorption experiments were conducted in test tubes, under controlled conditions, at room temperature (25 ºC). The initial concentration of FA-(2,4-DNPH) solution examined was 9 mg/L, and various contact times were considered. The experimental results suggested that FA-(2,4-DNPH) has a low affinity for quartz sand, but an enhanced potential for adsorption onto MWCNTs. FA-(2,4-DNPH) adsorption onto quartz sand and MWCNTs was more pronounced under dynamic than static conditions, probably due to agitation improved mixing of the absorbent within the solution. The collected adsorption data were adequately described by a pseudo-second order kinetic model and intraparticle diffusion model. Our findings suggested that pristine MWCNTs could be promising adsorbent for groundwater remediation.