Nanodiamond as a Novel Green Adsorbent for Heavy Metal Removal

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With the growing concern over environmental issues and the rapid development of nano materials, an efficient adsorbent for heavy metal removal is crucial. In our research, we used Nanodiamond (ND) made by High Temperature High Pressure (HTHP) process, and ran through acidified procedure to enhance NDs' carboxylic acid groups' (-COOH) ratio. ND-COOH was used as an adsorbent and the mechanisms and characteristics in the adsorption reaction were examined. The materials were characterized by several techniques, including IR spectroscopy, Scanning Electron Microscopy (SEM), Zetasizer, ICP-MS, confocal microscopy …etc. For the purpose of being an environmental friendly adsorbent, biocompatibility is a crucial factor. We found that ND was not harmful to the creatures in aquatic environment, a fact verifiable when we added ND(aq) to algae, Ultracularia gibba. In term of the heavy metal removal, our results show that the adsorption capacity is varied with different metal ions'. In addition, the effect of the NDs concentration, pH and the time of adsorption were all studied in our research. Reusability is also an important factor to become a novel green adsorbent. NDs is found to be reusable after adding nitric acid to the NDs precipitates. All these are consistent with the key elements of the Twelve Principles of Green Chemistry, which concerned Prevention, At-om Economy, Designing Safer Chemicals, and Renewable Feedstock.

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