Porous silicon nanoparticles and magnetite-chitosan-reduced graphene oxide for simultaneous removal of heavy metals and anionic surfactant

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The simultaneous removal of di erent types of pollutants is extremely challenging for environmental and material science. Water dispersible magnetite-chitosan reduced graphene oxide (MCRGO) submicron particles were synthesized and combined with positively charged porous silicon nanoparticles (PSi NPs) mainly through electrostatic interactions for the simultaneous removal of toxic heavy metals and anionic detergent pollutants, organic dye and pesticide as well. PSi NPs o er great potential for the simultaneous removal of inorganic and organic compounds due to their ability for adsorbing hydrophobic and hydrophilic compounds, and other negative charged materials, on their internal and external surface. e MCRGO hybrids showed high binding capacity for positive charged heavy metal ions and were easily separated by an external magnetic eld. Here, we report the combination of MCRGO and PSi NPs as an e cient biocompatible platform for complete elimination of toxic heavy metals cadmium (Cd^{2+}) and lead (Pb^{2+}) as well as the anionic $C_{12}H_{25}SO_4^-$ from sodium dodecyl sulfate (SDS) water solutions, and dye oil red O and pesticide by adsorption. Overall, the combination of MCRGO and PSi NPs holds great potential for complex waste water treatment beyond multiple heavy metals, detergent and pesticide based pollutants.

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