Concluding Remarks and Future Perspectives of Nanosponges in Environmental Remediation

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1 Introduction

Nanosponges are cross-linked, thermally stable, polymeric nano-sized structures having large surface areas with a well-defined pore size that are suitable for enclosing various substances [76]. These are the class of nanomaterials that have gained significant attention in recent years due to their unique properties and wide range of applications. They are essentially nanoscale structures composed of porous networks that can absorb and carry various substances, making them versatile and multifunctional materials [18]. The term "nanosponges" is derived from their resemblance to traditional sponges, which are highly porous and capable of absorbing liquids. However, nanosponges operate at a much smaller scale, typically ranging from a few nanometers to hundreds of nanometers in size.

Nanoparticles have a wide variety of applications such as biocompatible material, textile functionalization, and coatings against UV-radiation or allowing microbial degradation, dug delivery, DNA delivery, enzyme immobilization, removal of water contaminants like heavy metals, dyes, organic compounds, etc. Nanotechnology is potentially the most important engineering revolution since the industrial age. So far nanotechnology resulted in variants of formulation like nanoparticles, nanocapsules/nanospheres, nanosuspensions, nanocrystals, nano-erythosomes, etc. In recent years, nanomaterials are gaining a lot of attention. In 1955 Richard R. Feynman, a physicist, at Cal Teach, forecasted about nanomaterials. He said "There is plenty of room at the bottom", and suggested that scaling down to the nano level and starting from the bottom was the key to future advancement in nanotechnology. Nanosponges are sorbent materials based on sorption properties that is absorption and adsorption together. Nanosponges have a great potential for the systematic removal of organic/inorganic pollutants from wastewater based on disinfection and sorption processes.

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