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Detoxification of Sarin Using Mesoporous Silica Nanoparticles

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The use of Chemical Warfare Agents (CWA) like Sarin an organophosphate nerve age are dangerous and deadly to animals and humans. In the 21st century, the stockpiles of chemical warfare agents are still available which have not been destroyed nor accounted for. The with the imminent threat CWA like Sarin are needed that can absorb and detoxify these deadly CWAs in order to protect our troops abroad from potential exposure of Sarin. Mesoporous silica nanoparticles (MSNs) are solid materials that have excellent biocompatibility, well-defined pore structures, thermodynamically stable, easy to manipulate morphology and surface chemistry. Due to their large pore size, large surface areas, and reactivity with silanol (≡Si-OH) groups MSNs are ideal for the absorption of Sarin. In order to test the effectiveness of MSNs in the future we will uses Dimethyl methylphosphonate (DMMP) a gas molecule that mimics Sarin which is safer and less reactive. The synthesis of MSNs will be would be characterized by using Transmission Electron Microscopy (TEM) and Scanning electron microscopy (SEM). The properties of the mesoporous will be analyzed through N_2 sorption isotherms at 77 K and pore size distribution would demonstrate the key characterization of the MSNs. In order to test absorption properties of the MSNs with DMMP a thermodynamic analysis based on micro-gravimetric experiment would be taken. In order to obtain the mechanism of reaction between DMMP and MSNs solid-state solid state nuclear magnetic resonance (1H-NMR) and spectrometer Fourier transform infrared (FT-IR) would be taken to verify the substitution-reaction between H of silanol group and methyl group of DMMP. Which would show that detoxifying organophosphate nerve agents is possible by utilizing MSNs.