The synthesis of glass based adsorbents for $^{14}CO_2$ capture

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Radioactive gases generated at nuclear facilities are purified by activated carbon filters in the air purification system for environmental protection. The spent activated carbon filter must be replaced periodically, beacause it is not working properly after adsorption of radioactive gases. Thermochemical treatments are carried out to reduce the volume of radioactive waste and further to recycle the spent activated carbon. Radioactive carbon dioxide comes out from spent activated carbon during thermochemical treatment. Since radioactive carbon has a long half-life of 5,730 years, it must be removed as a solid by fixation for long-term disposal and safety. In this presentation, we will talk about the removal of radioactive CO_2 in aqueous phase using a glass-based adsorbents which contain alkaline earth metal ions in their structure. Alkaline earth metal ions dissolved out from the glass-based adsorbent react with carbon dioxide in water to form insoluble metal carbonates. The glass-based adsorbent and its CO_2 capture performance are characterized by X-ray diffraction, Scanning Electron Microscope, Transmission Electron Microscope, and Thermogravimetric Analysis-Mass Spectrometry