Mineralization of $^{14}CO_2$ from Carbowaste Treatment using Glass-based Adsorbent

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In the nuclear facility, gaseous radioactive materials are removed through the activated carbon filter in the HVAC system (Heat, Ventilation, & Air Conditioning) for environmental protection and safety of radiation workers. The spent activated carbon is replaced on a regular basis. The replaced spent activated carbon is treated through thermo-chemical treatment to remove radioactive materials. When activated carbon is treated with thermo-chemical processes, carbon is existing as a form of $^{14}CO_2$. The $^{14}CO_2$ should be adsorbed at room temperature under atmospheric pressure considering not only the stability of radioactive material but also preventing re-release of $^{14}CO_2$. In this presentation, Sr^{2+} is incorporated to the glass structure and reacted with carbon dioxide in aqueous phase to mineralize CO_2 into $SrCO_3$. When Sr^{2+} ions are released from Sr-glass, Sr^{2+} ions and HCO^{3-} react to adsorb CO_2 in the form of $SrCO_3$. The CO_2 capacity of Sr-glass depends on the size of the adsorbent and ranging is from 2.5 mmol CO_2/g to 4.2 mmol CO_2/g. The CO_2 loaded adsorbents were characterized by XRD (X-ray diffraction) and TGA-MS (Thermogravimetric Analysis/Mass Spectrometry).