Seminar

Institute for Plasma Research

Title : Alumina-Embedded Mesoporous Silica Adsorption Characteristics of Molybdenum in Medical Radioisotope Applications

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Date : 20th November 2017 (Monday)

Time : 03.30 PM

Venue : Seminar Hall, IPR

Abstract :

Technetium-99m (^{99m}Tc) is a widely used radioisotope widely employed in nuclear medicine diagnostics imaging such as bone scans, tumour imaging, cardiac perfusion and brain perfusion etc. The radio pharmaceutical ^{99m}Tc is obtained as a low decay of Molybdenum-99 (^{99}Mo) to ^{99m}Tc with a short half-life ($T_{1/2}$=6.02 h) and its suitable gamma energy for Single-Photon Emission Computed Tomography (SPECT). Mo as a parent radioisotope can be generated as a uranium fission product. However, this is associated with several other by-products necessarily requiring complex separation techniques to obtain ^{99}Mo. Alternately, ^{99}Mo can be produced from molybdenum oxide or metallic molybdenum activated neutrons but generally with significantly lower level of activity. Since Alumina has a limited adsorption capacity of 2-20 mg Mo per gram of alumina, the development of higher adsorbent materials for use in ^{99m}Tc generator based molybdenum activation neutron is highly desired.

Among the possible adsorbent materials for Mo, mesoporous silica has been considered as a good candidate because of its unique properties such as high surface are, large pore volume and tunable pore size qualifying as an excellent adsorption and separation applications. In this paper, we have prepared alumina-embedded mesoporous silica and investigated their molybdenum adsorption characteristics. To synthesize such materials, mesoporous sili $Al_{0.1}$-MPS <ca particles were firstly synthesized via soft-tempered approach followed by the introduction of luminum butoxide into mesopores, which was converted into alumina by heat treatment at high temperatures. The alumina embedded mesoporous (Al_x-MPS) were characterized by low and wide angle X-ray diffractions, nitrogen adsorption-desorportion isotherms and transmission electron microscope. The effect of Al/Si ratios and calcination temperature on their Mo adsorption have been characterized. Results shows Mo adsorption with respect to calcination temperature as 750 C > 600 C > 900 C > 1050 C. Similarly Mo adsorption with respect to Al/Si molar ratio is $Al_{0.1}$-MPS < $Al_{0.3}$-MPS < $Al_{0.5}$-MPS < $Al_{0.6}$-MPS.

Details of these investigations will be presented in the talk.