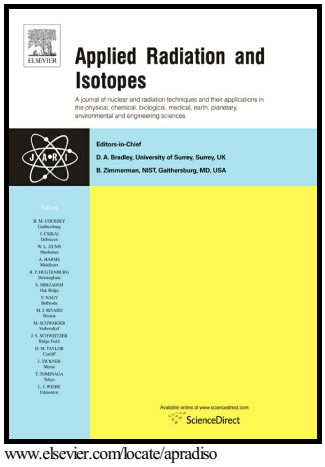

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Nano-Technology Contributions towards the Development of High Performance Radioisotope Generators: the Future Promise to Meet the Continuing Clinical Demand

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Abstract

Nanostructured materials attracted considerable attention because of its high surface area to volume ratio resulting from their nano-scale dimensions. This class of sorbents is expected to have a potential impact on enhancement the efficacy of radioisotope generators for diagnostic and therapeutic applications in nuclear medicine. This review provides a summary on the importance of nanostructured materials as effective sorbents for the development of clinical-scale radioisotope generators and outlining the assessment of recent developments, key challenges and promising access to the near future.

Keywords: Nano sorbents; Radioisotope generators; Nanotechnology; ^{99}Mo/^{99}Tc generators; ^{188}W/^{188}Re generators; ^{68}Ge/^{68}Ga generator; Radiopharmaceuticals.

1. Introduction

The importance of using short-lived and ultra-short-lived radionuclides in nuclear medicine; either in diagnostic purposes or as a therapeutic tool, has considerably grown because after the study is complete and the desired information is obtained, their radioactivity disappears rapidly by radioactive decay. However, these radionuclides may be produced via high flux reactors and modern cyclotrons, three problems are accompanied with their production **(Saha, 1992)**. These problems are:

1. Cost,
2. Cross-contamination due to side nuclear reactions,
3. Transportation.

There are two ways to overcome such difficulties. One of the choices is to use a neutron source to activate the materials of choice in-situ, i.e.; californium source, (^{252}Cf neutron source ($T_{1/2}$=2.6 y) emits from 10^7 to 10^9 n/sec), but the neutron flux is often too small to produce radioactive isotopes in usable amounts. The well-established choice is to use radioisotope generators **(Castronovo and Wagner, 1971;**