



Molybdenum-99/ Technetium-99m Generator Based on Alumina Gel

**A Thesis Submitted By
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To

**Chemistry Department
Faculty of Science
Ain Shams University**

**For Doctor degree in
the Philosophy of Science
(Chemistry)**

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Dedication

This thesis is dedicated to

My parents

My wife's parents

Special dedication to my
lovely wife Jena and my
beautiful daughters Jessy
and Lavina

ABSTRACT

Technetium-99m is called the work horse, for many reasons, in nuclear medicine diagnostic purposes. It is produced as the β^- decay of ^{99}Mo radionuclide. Molybdenum-99 gel type generators are considered as suitable alternatives of the conventional chromatographic alumina columns loaded fission molybdenum-99. ^{99}Mo solutions are cross-contaminated with ^{95}Zr , ^{95}Nb , ^{103}Ru , ^{124}Sb , ^{125}Sb , ^{125}Sn ..etc. Except for ^{103}Ru , the detected radiocontaminants are common from activation ^{99}Mo and fission ^{99}Mo products. To prevent contamination of the eluted $^{99\text{m}}\text{Tc}$, sequential purification and Al^{99}Mo precipitation methods were conducted. After complete dissolution of thin Al foil and MoO_3 powder (tagged with ^{99}Mo) in presence of Fe(III) with 5M NaOH solution, hydrogen peroxide was added to precipitate of $\text{Fe}(\text{OH})_3$ with partial elimination of radiocontaminants, ^{95}Zr , ^{95}Nb , ^{103}Ru , ^{124}Sb , ^{125}Sb and ^{125}Sn from the molybdate solute. The elimination % were gradually increased with increasing the total amount of fed iron dose in the system. Highly pure Alunate/ molybdate- ^{99}Mo mixture solution was acidified with concentrated HNO_3 to precipitate Al^{99}Mo gel matrix at pH 5.5. The formed precipitate was washed and dried, then packed in the form of a chromatographic column. The generated $^{99\text{m}}\text{Tc}$ was eluted with 0.9% NaCl solution and exhibited high radionuclidic, radiochemical and chemical purity suitable for use in medical purposes.

Key words: ^{99}Mo -molybdate / purification / Fe(III) mineral / alumina- ^{99}Mo -molybdate (VI) / ^{99}Mo - $^{99\text{m}}\text{Tc}$ generator/ Q.C indices.

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- 2- El-Absy M.A, El-Garhy M.A, El-Amir M.A, **Fasih T.W**, Ramadan H.E, El-Shahat M.F, Synthesis of alumina ^{99}Mo -molybdate (VI) gel matrices and evaluation of $^{99\text{m}}\text{Tc}$ elution performance, J.Radiochemica Acta (Accepted).

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