Proiect nucleu DFNA
Tema: Tritium absortion and penetration through materials

Today, sources of tritium include biological research laboratories, commercial nuclear reactors, research reactors, nuclear reprocessing plants and weapons production plants.

A precise and sensitive study of tritium absorption in different materials has a key role. Research of tritium abortion was performed also in the past however, the experimental data are referring only to the surface absorption of tritium and do not contain information about the bulk absorption.

AMS can determine the concentration of elements performing a depth profiling of the concentration. Due to their sensitivity, AMS measurements can determine the tritium concentration deep in the bulk of materials and predict total penetrations through the containers of tritium and facilities.

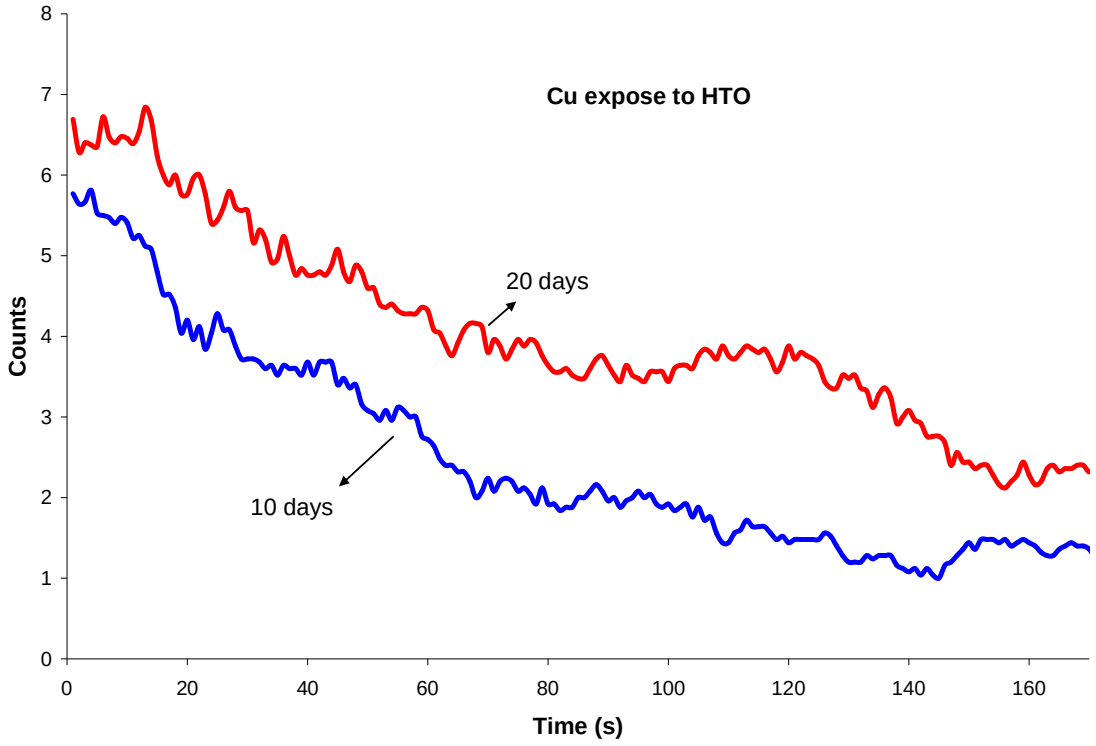
Preliminary results obtained by our AMS depth profile analyze revealed absolutely new and unknown behavior of materials like Pd, Nb, Al, Zr, MgB2, Ta, Cu, and steels when exposed to tritium as liquid or gas.

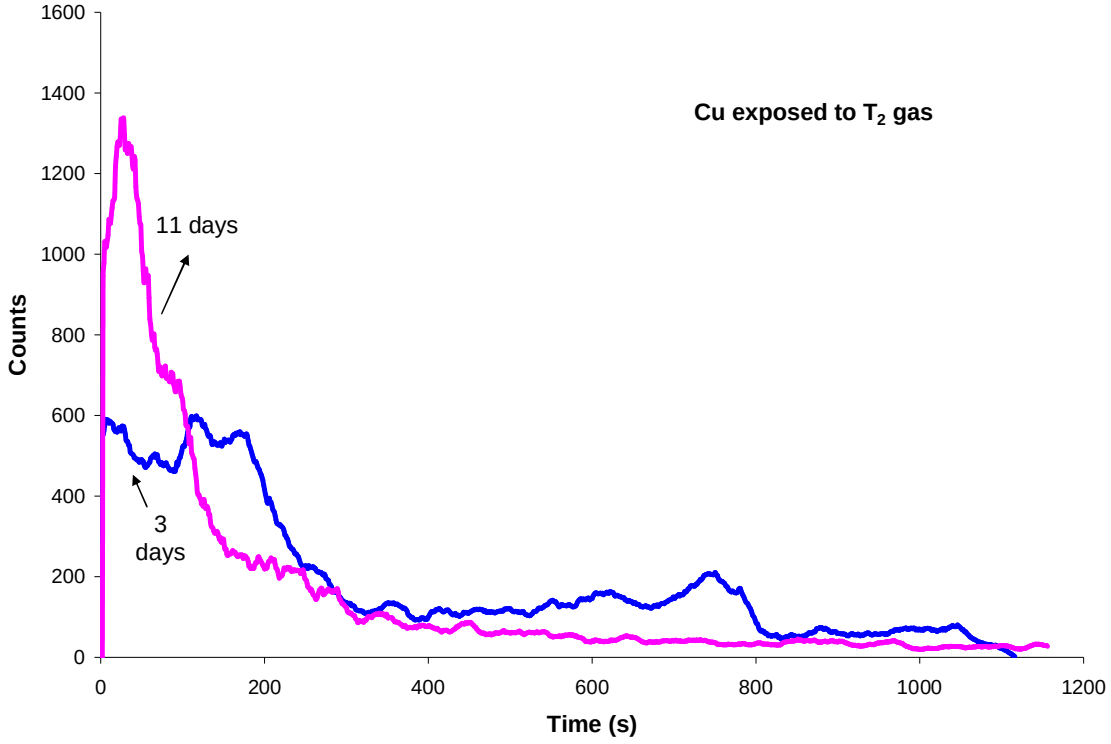
Our preliminary AMS depth profile information showed that tritium is penetrating materials very deep into the bulk and the transfer from tritiated water or from gas has shown many new characteristics.

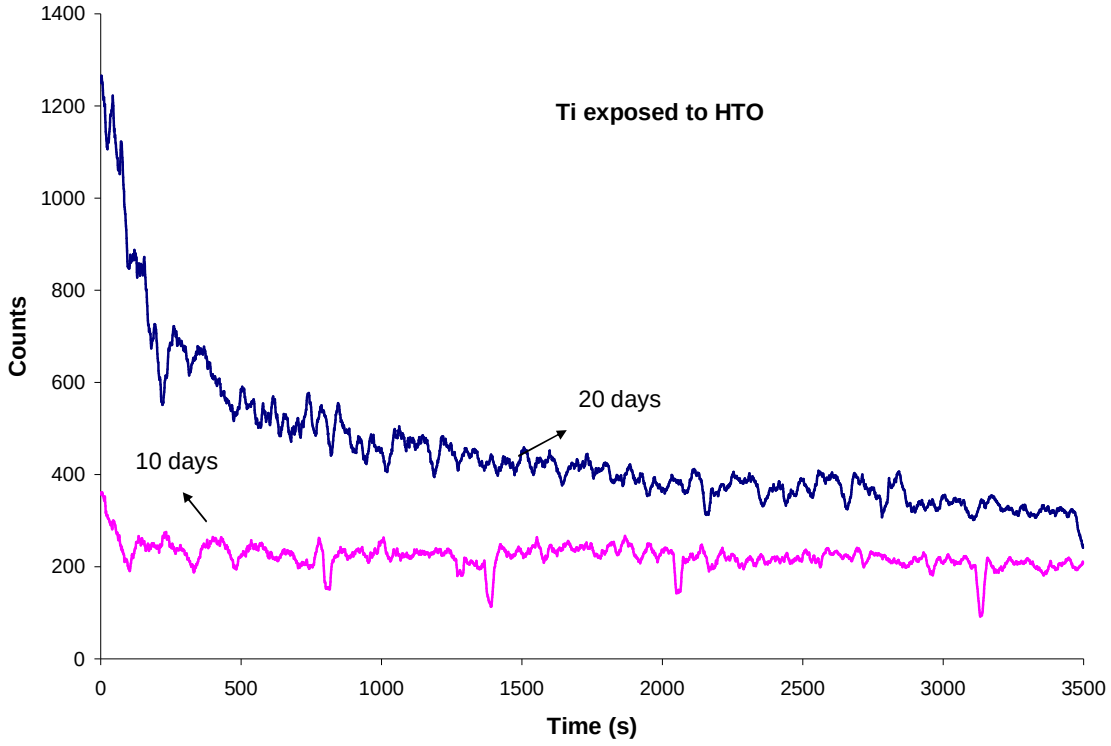
The experimental research has a major interest for the tritium technology and therefore several exposure conditions to tritium have teste.

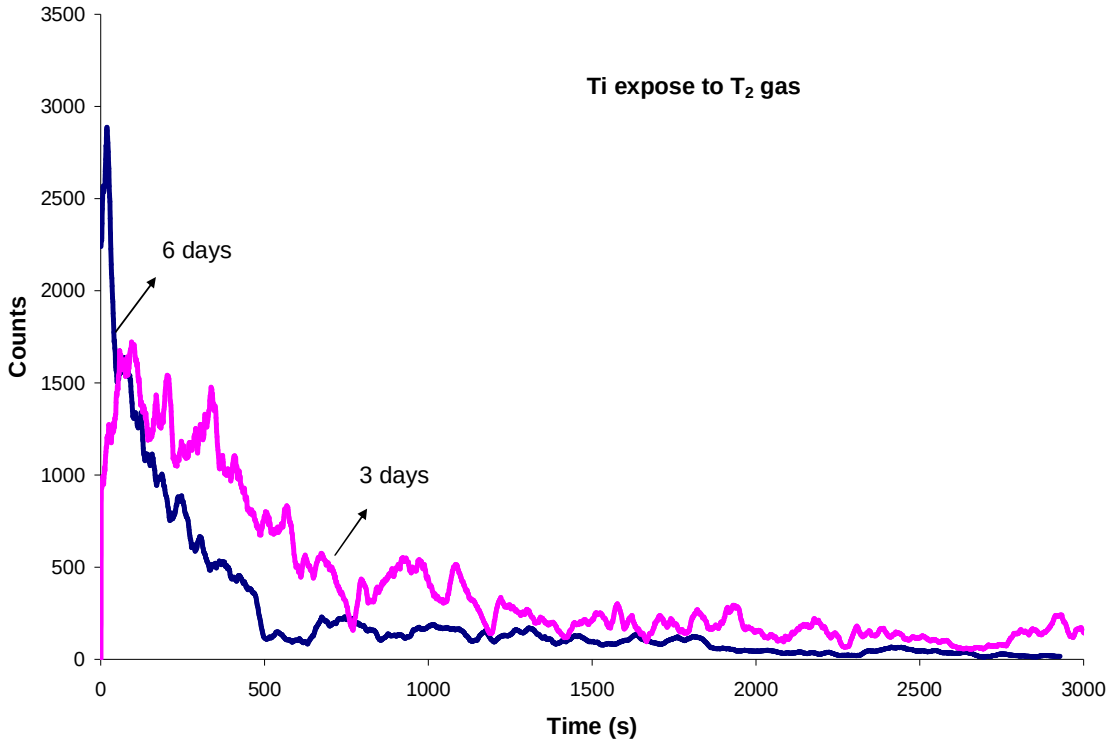
Some example of results from the last beam time, that was recently nding, are shown below.

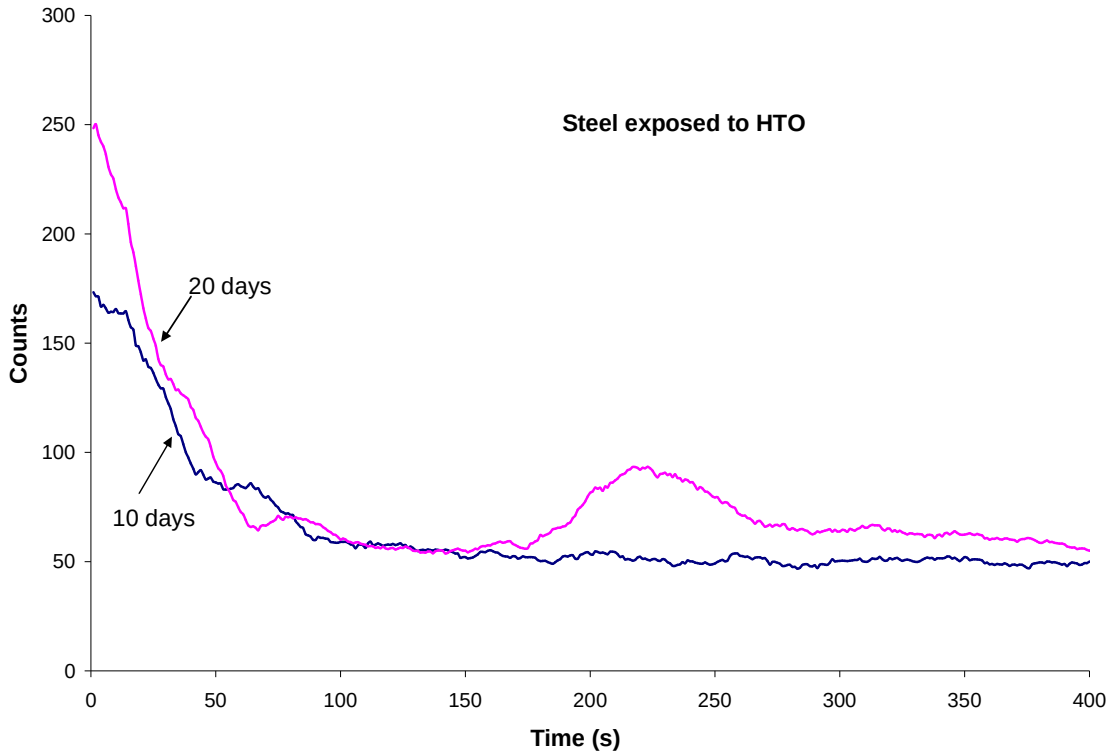
Results of the project 72185: AMS nanotechnology applied for the Investigation of Tritium mobility and absorption in materials, a method used in detritiation plants of heavy water from nuclear power plants with the final aim of environment and life protection.


Cu expose to HTO
Counts
Time (s)
20 days
10 days
0
1
2
3
4
5
6
7
8
0
20
40
60
80
100
120
140
160


Cu exposed to T2 gas
Counts
Time (s)
11 days
3
days
0
200
400
600
800
1000
1200
1400
1600
0
200
400
600
800
1000
1200


Ti exposed to HTO
Counts
Time (s)
20 days
10 days
0
200
400
600
800
1000
1200
1400
0
500
1000
1500
2000
2500
3000
3500


Ti expose to T2 gas
Counts
Time (s)
6 days
3 days
0
500
1000
1500
2000
2500
3000
3500
0
500
1000
1500
2000
2500
3000



Until now, in our research we have measured 32 samples by AMS. However, not all conditions of exposure and depth penetration could be covered. Therefore at least two or three more decades of AMS experiments are required for a comprehensive study.

Our AMS measurements are accompanied by AFM and SEM investigation as well as magnetic and structural measurements of the solid state for composed materials (IFIN-HH in cooperation with IFTM).

Requested Beam Time: 4 days or 2x2 days

Further requirements:

- 7.5 MV terminal voltage, continuously, for several days.
- 8.0 MV for short durations (aprox.10 min.) necessary for tuning with the 12C3+ pilot beam.

- **Any other observations sustaining its approval by the PAC.**

The tritium concentration of the samples and standards are below the exemption limits and exposure of personnel and plant contamination and are below the exclusion limits provided in the basic safety radiological rules (Romanian Law, no.111/96).

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