



Nuclear transmutations in D-Pd and H-Pd films induced by low power excimer laser beams

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Contents:

Samples

Experimental apparatus

Analysis

Results

Evidence of elements transmutation

Samples of silicon with thin Pd layer implanted with P ions



Samples loaded with deuterium or hydrogen gas and exposed to excimer laser beams



SEM, EDX and ICP analysis of samples after treatments



Evidence of presence of “new” elements inexistent in samples not processed



Hypothesis of nuclear fusion phenomena occurred into the lattice

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Samples

Substrate Si

1st layer 50 nm Ti

2nd layer 500 nm Pd

Implanted with:

- P at 150 keV
- As at 150 KeV

Atomic weight :

P= 30.97

As=74.92

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Samples

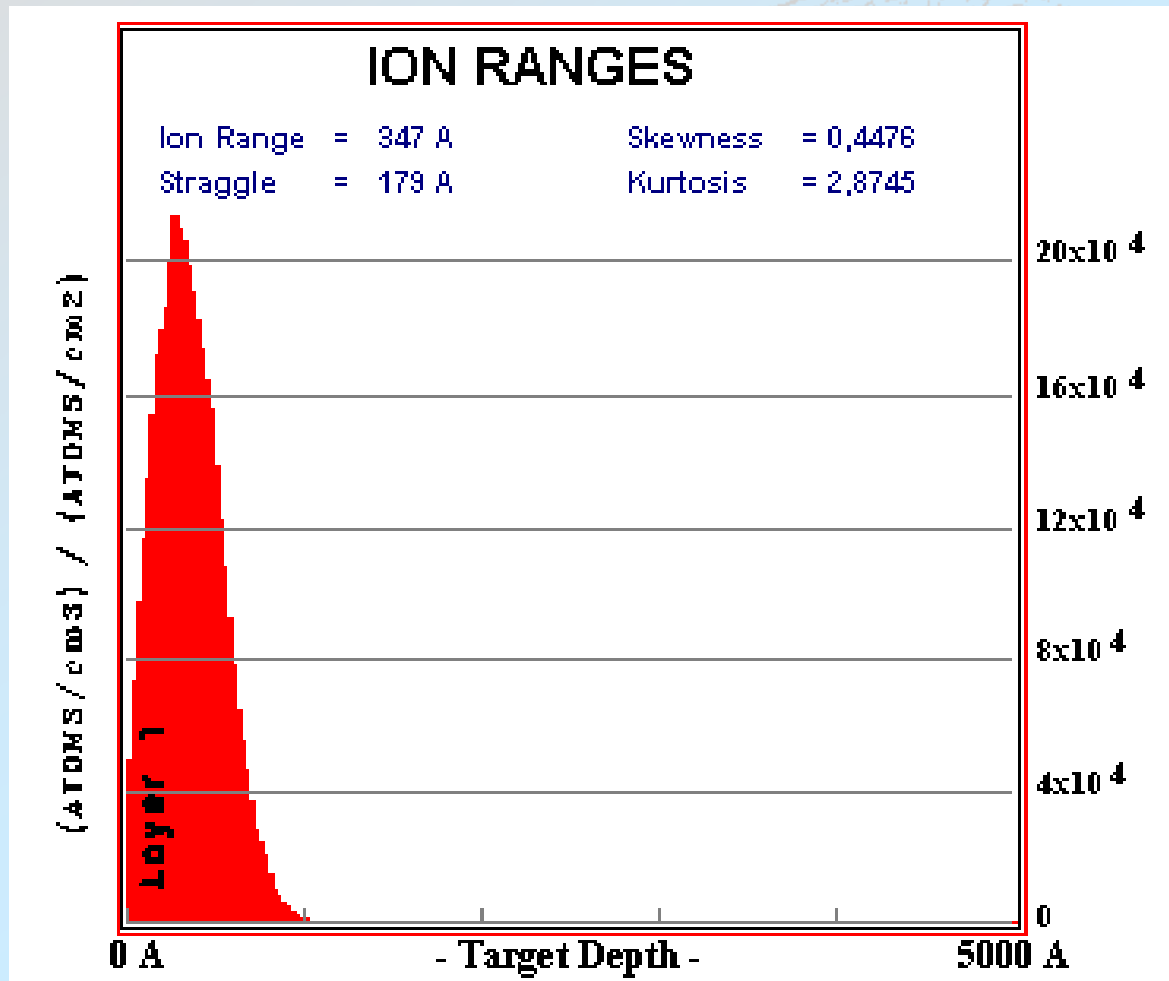
P and As implantation were done in order to try to force only specific nuclear reactions

Atomic weight :

P= 30.97

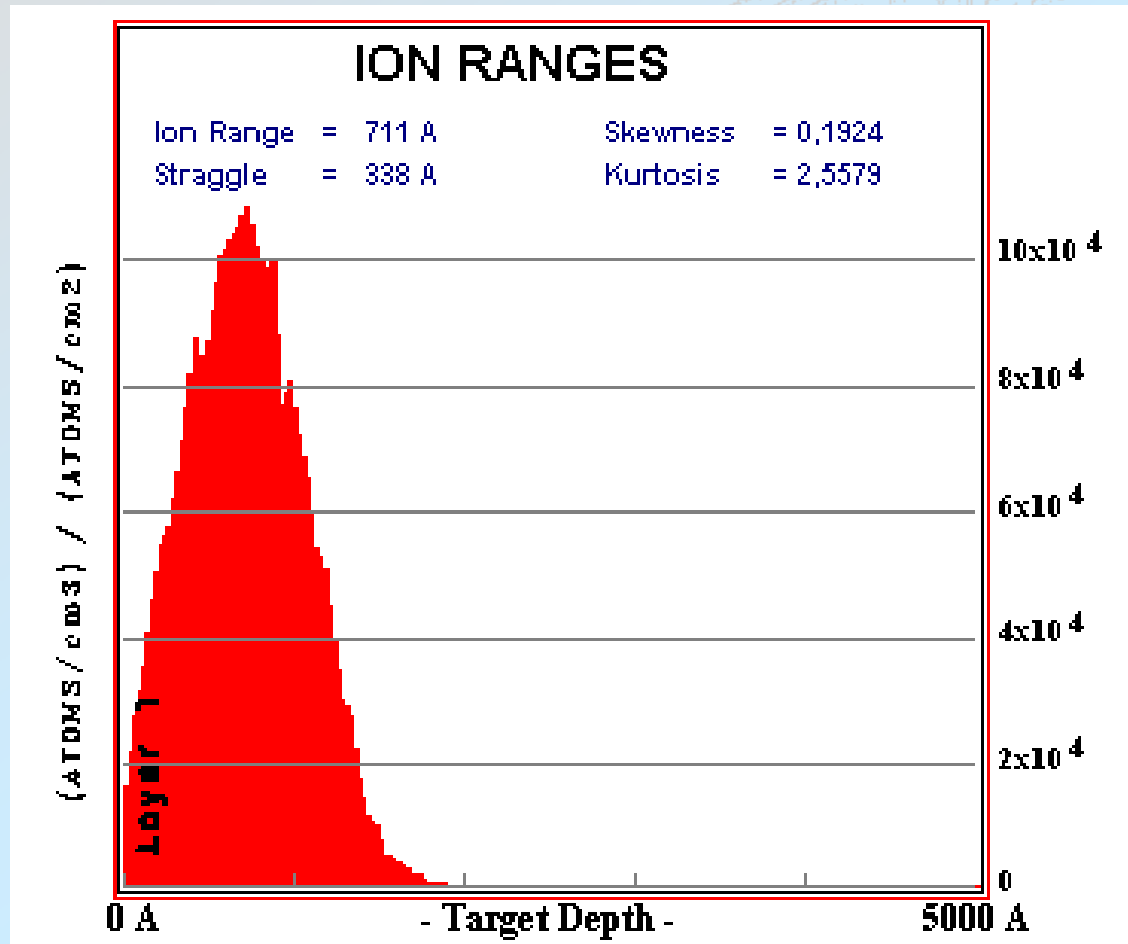
As=74.92

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As Implanted Pd
Energy = 150 keV

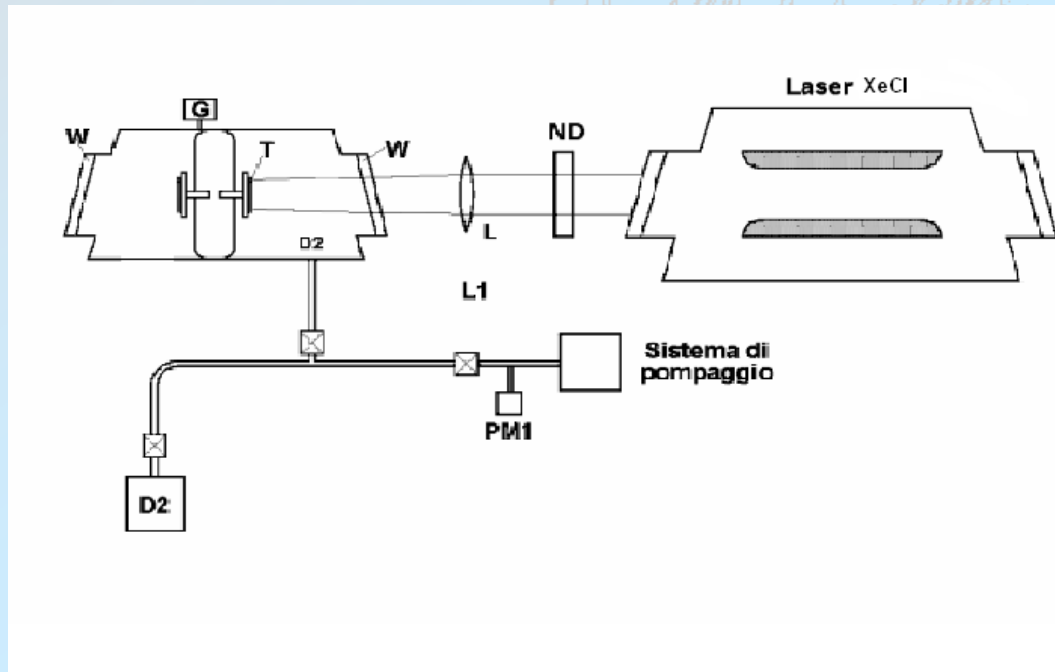
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P implanted Pd
Energy = 150 keV

Experimental apparatus

Apparatus Sketch



D2: Deuterium gas cylinder

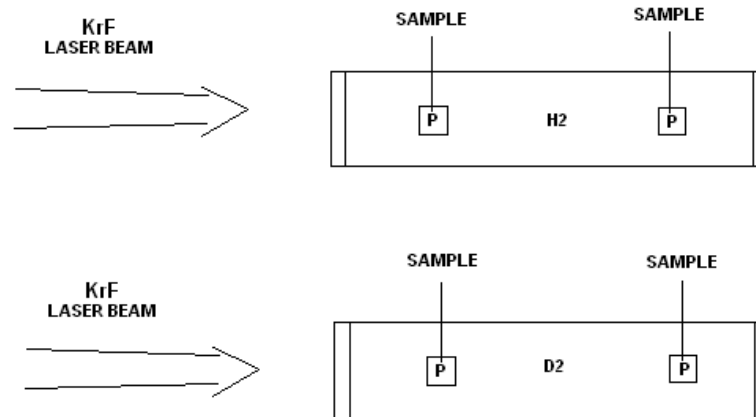
T: Target

W: Quartz window

L: Convergent lens

Experimental apparatus

Experimental setup



Experimental apparatus



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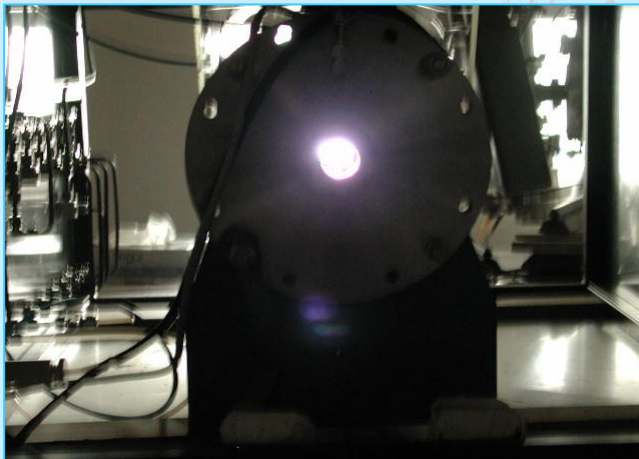
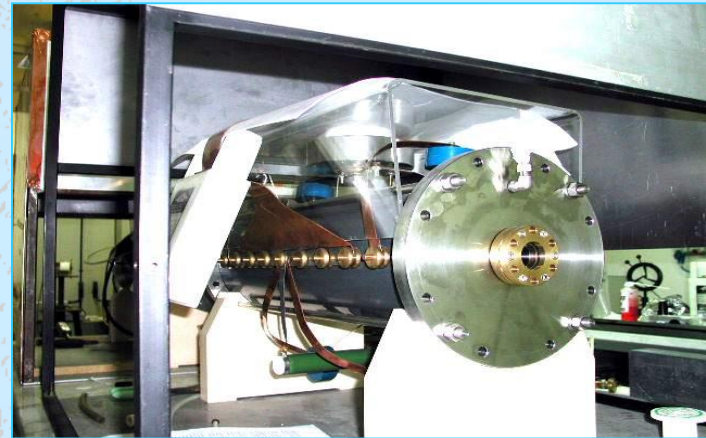
Laser characteristics

Type: KrF-248 nm

Pulse width: 20 ns

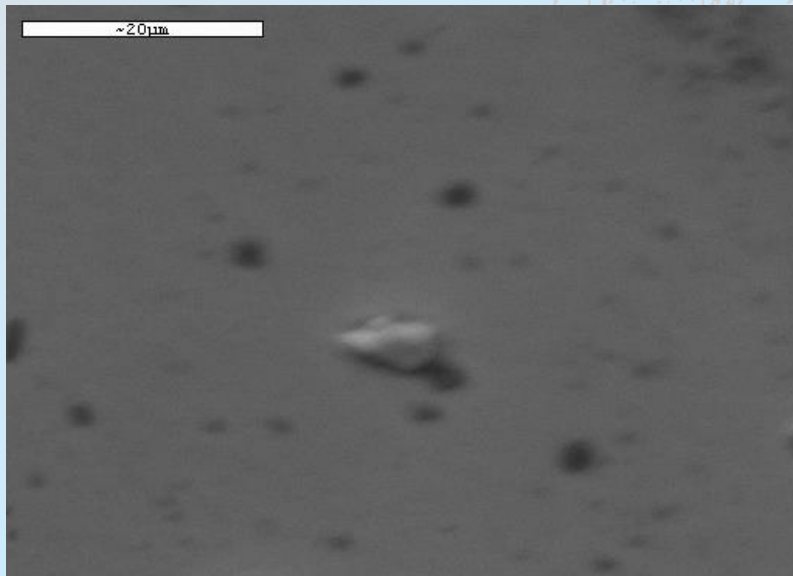
Repetition rate: 1 Hz

Laser fluence: 25mJ/cm²

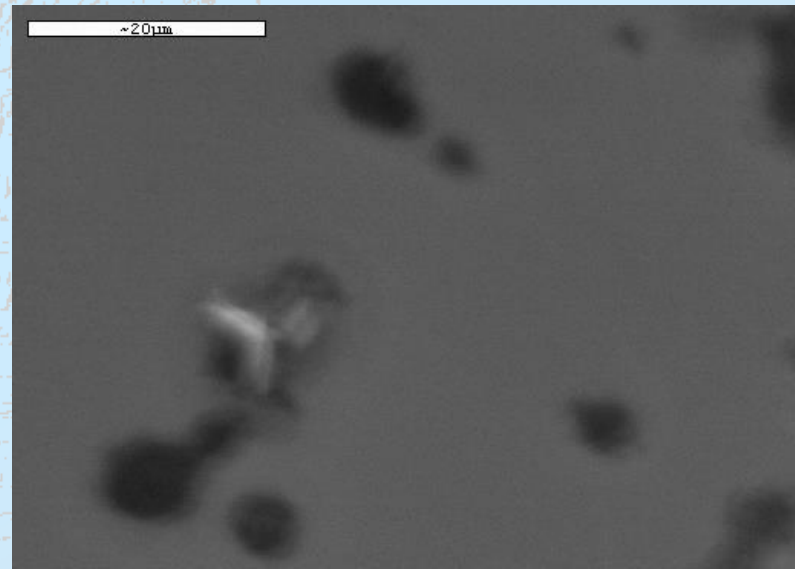


Samples Analysis

SEM analysis of samples loaded with D_2 or H_2 gas and irradiated by KrF laser



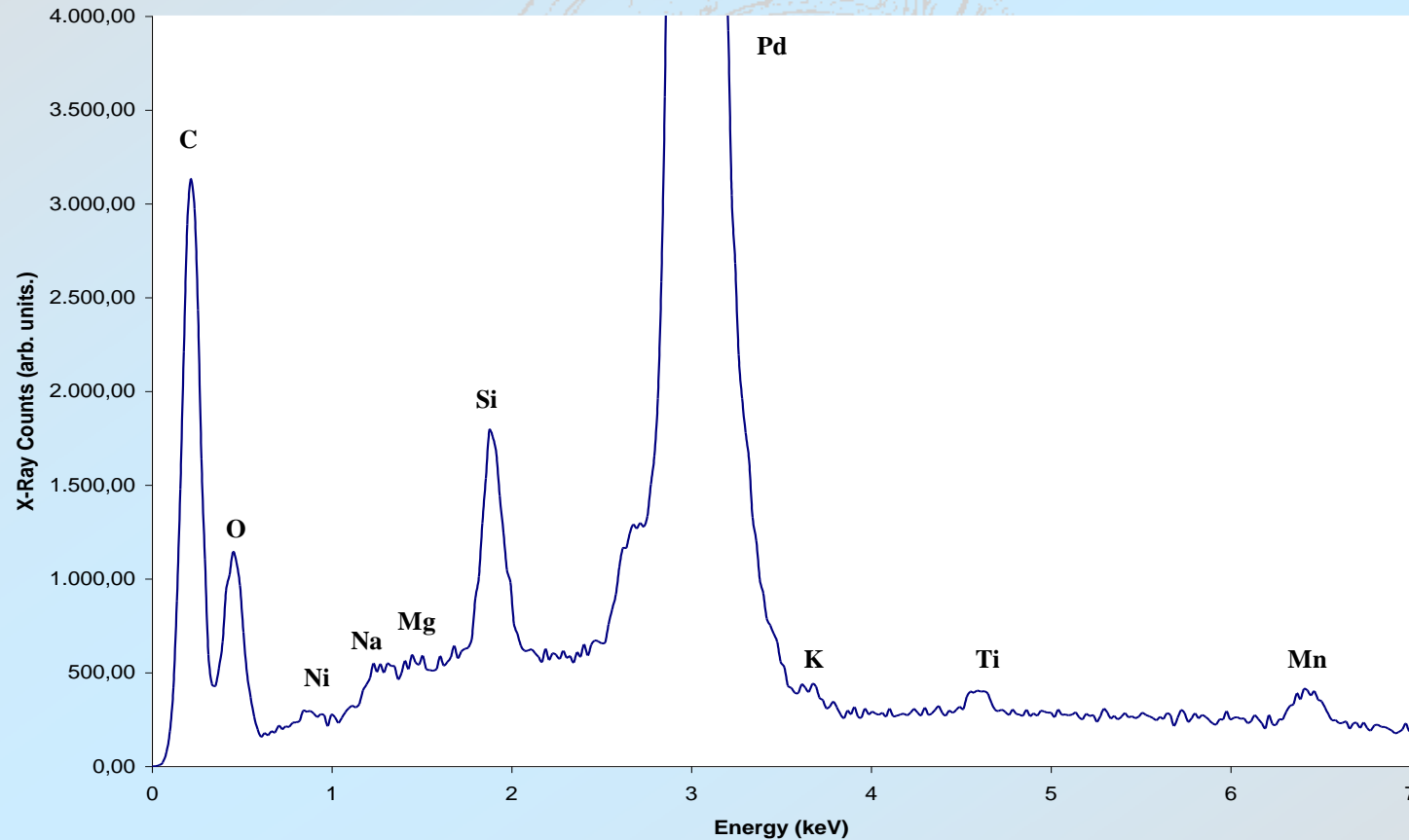
SEM micrograph of sample processed with H_2 gas and KrF laser



SEM micrograph of sample processed with D_2 gas and KrF laser

EDX Analysis

EDX spectra of samples loaded with H_2 gas and irradiated by KrF laser

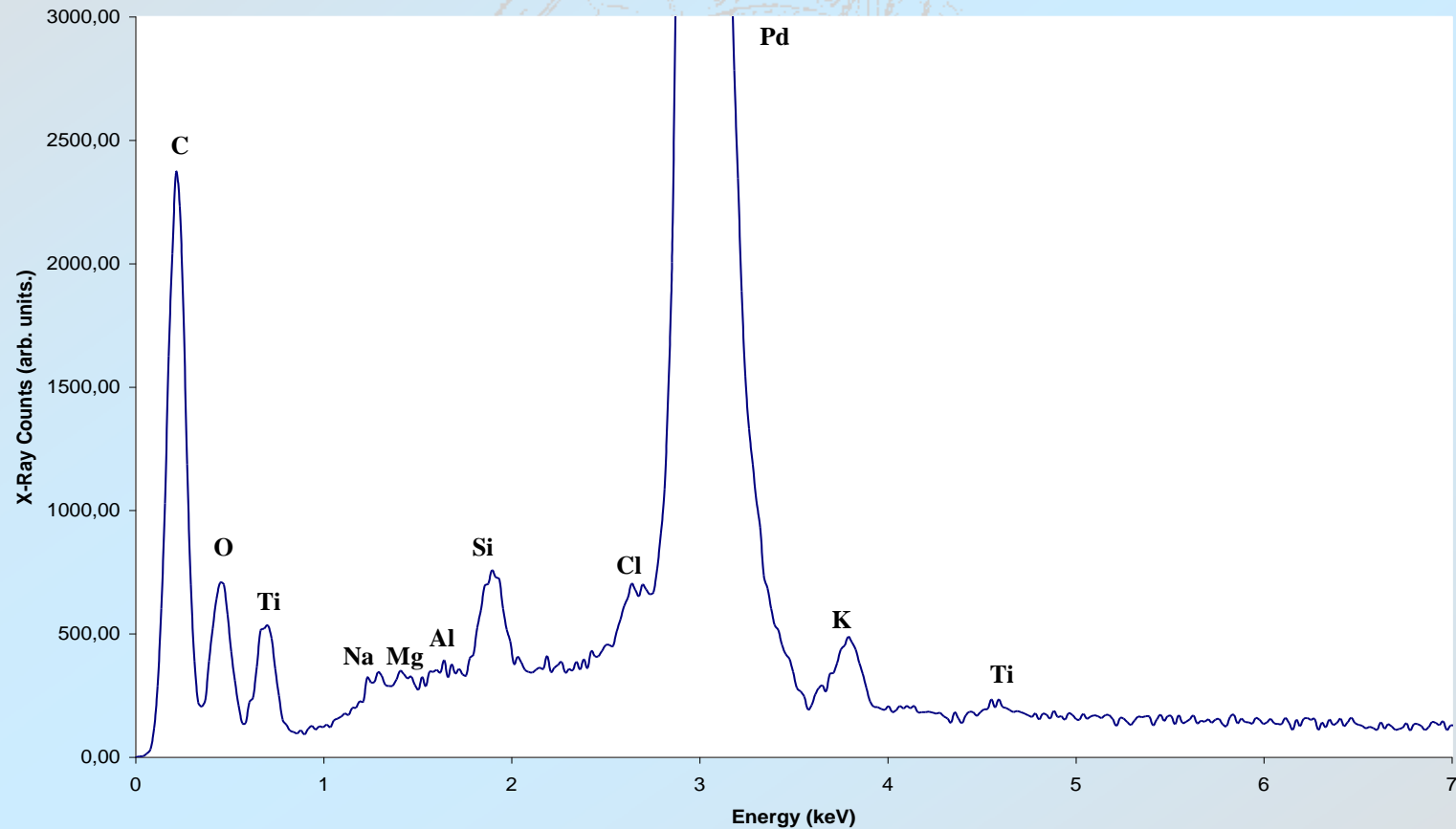


X-Ray spectrum of sample loaded with H_2

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EDX Analysis

EDX spectra of samples loaded with D₂ gas and irradiated by KrF laser



X-Ray spectrum of sample loaded with D₂

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Experimental results

H ₂		D ₂	
No-laser	Laser	No-laser	Laser
Si	Si	Si	Si
Pd	Pd	Pd	Pd
Ti	Ti	Ti	Ti
	C	C	C
	O	O	O
	Ca	Na	Na
	Na	Al	Ni
	Cr	S	Al
	Fe	Ca	K
	Ni	K	Mn
	Al	Mg	Cl
	S		
	K		
	P		
	Co		
	Mn		

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Conclusions

As in previous works, Pd samples irradiated with UV lasers beams show enhanced nuclear transmutation. These samples were implanted with specific elements in order to highlight the activated nuclear channel.

Most of the samples are still under analysis.