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STMicroelectronics

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

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

Contents:

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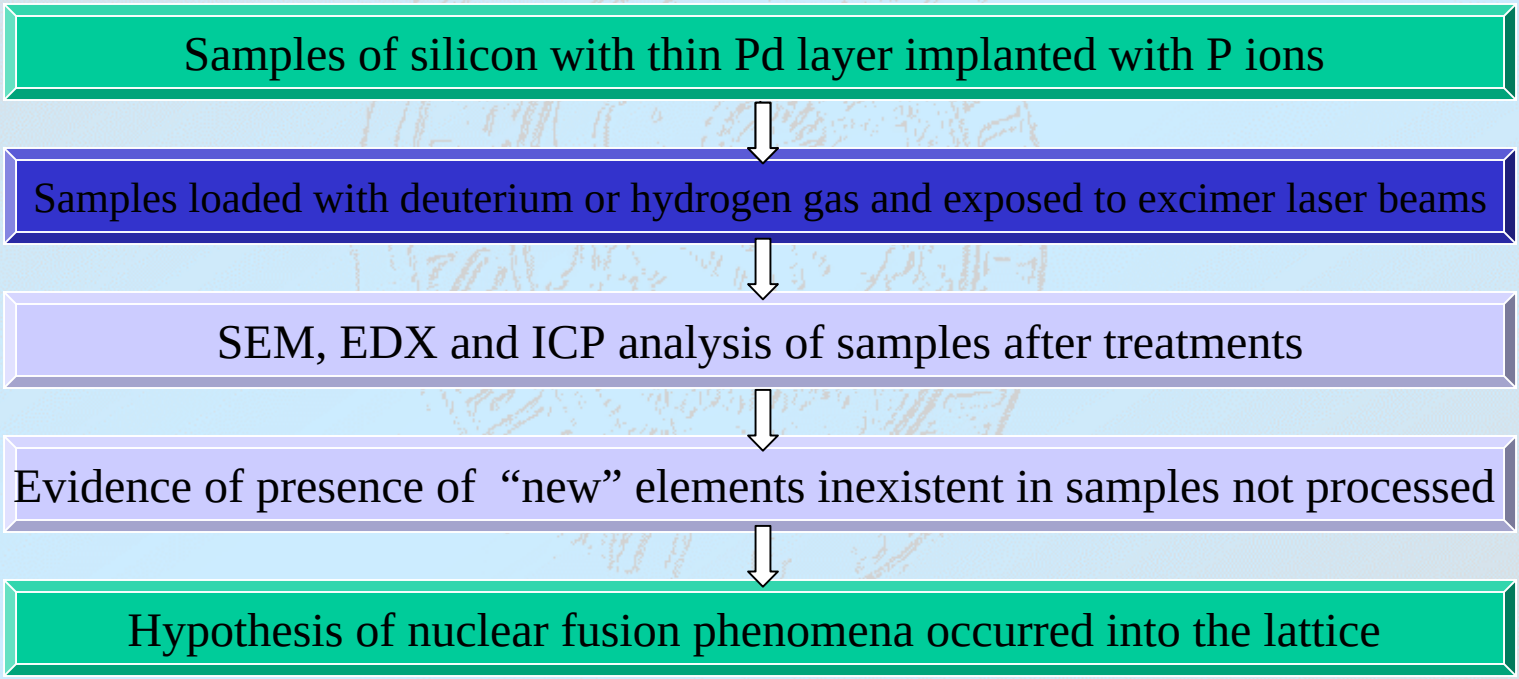
Evidence of elements transmutation



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

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

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

Samples

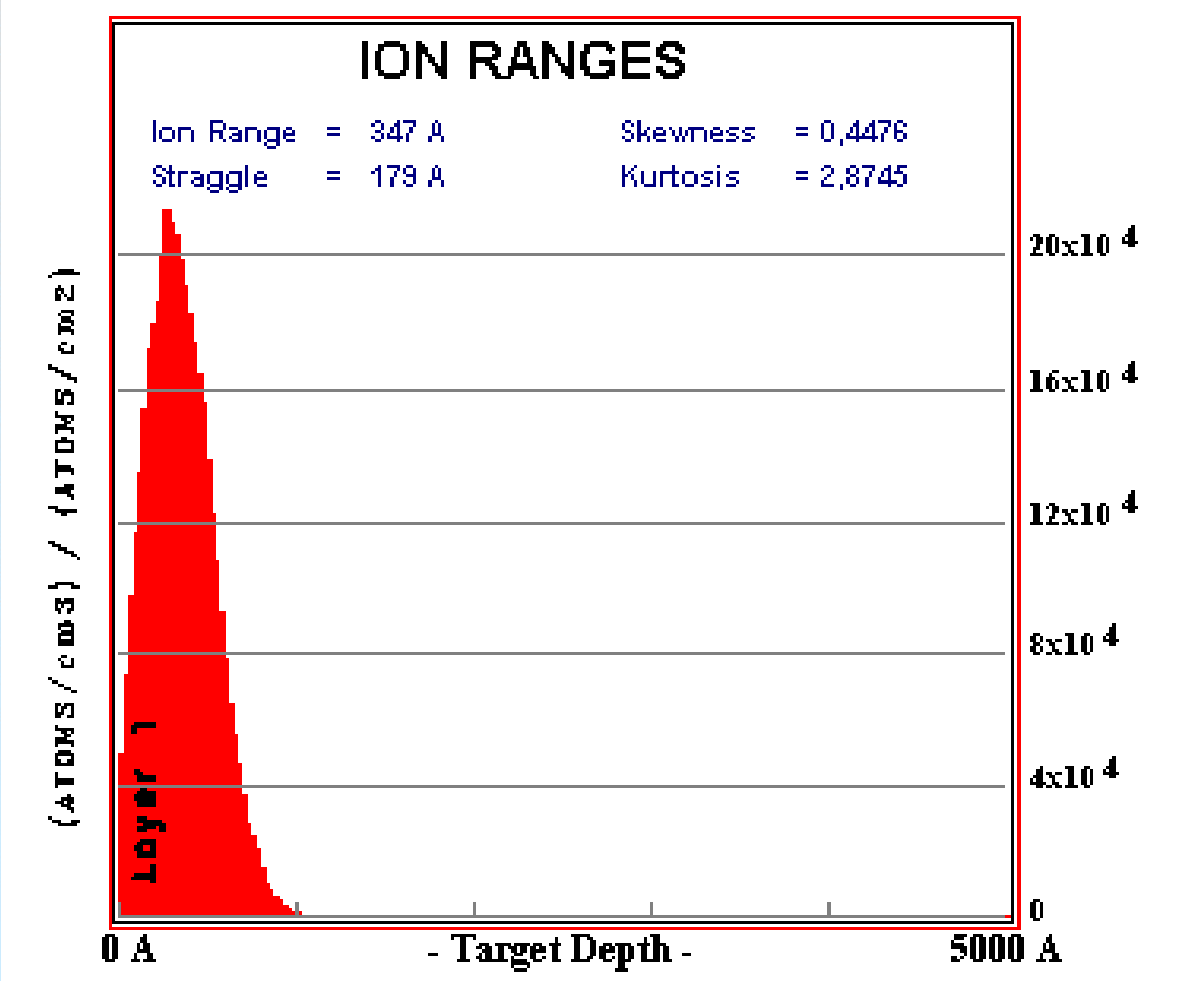
P and As implantation were done in order to try to force only specific nuclear reactions

Atomic weight :

P= 30.97

As=74.92

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



As Implanted Pd

Energy = 150 keV

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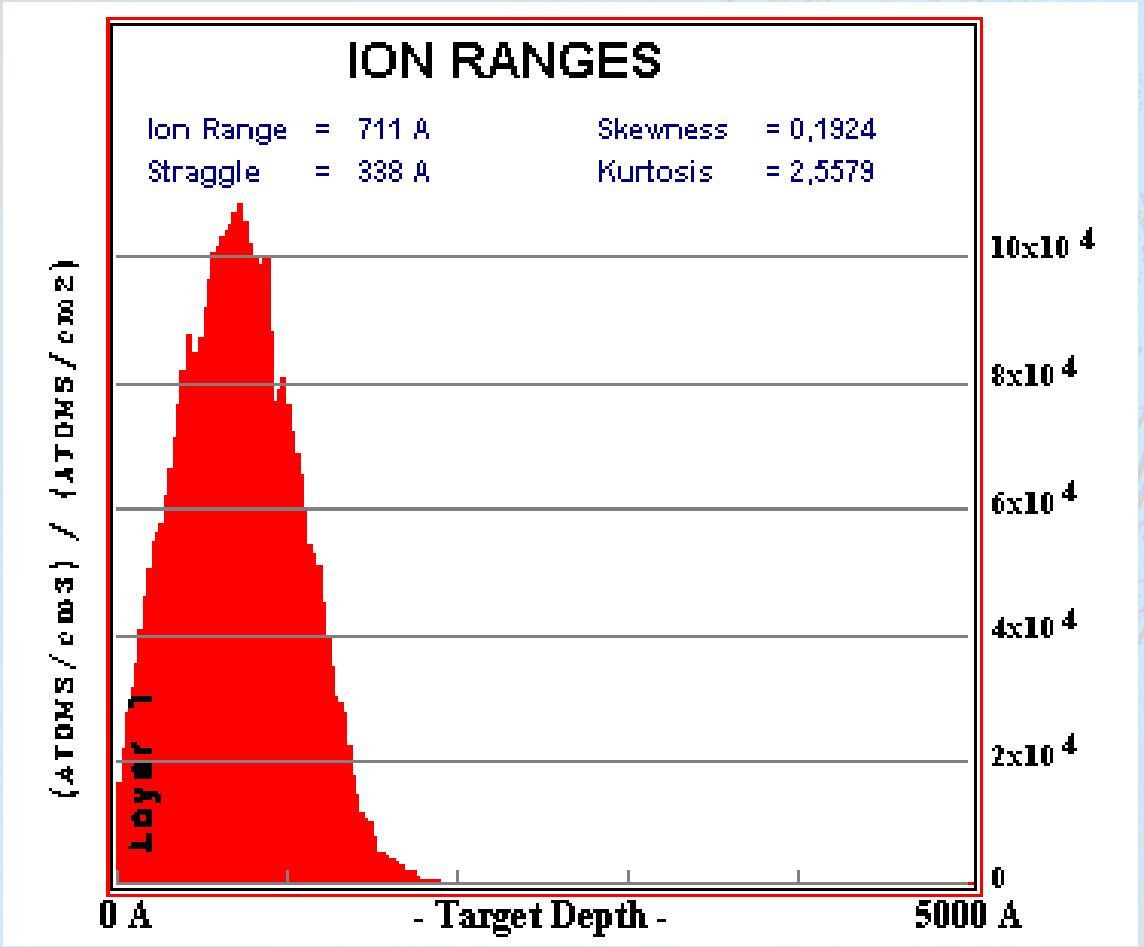
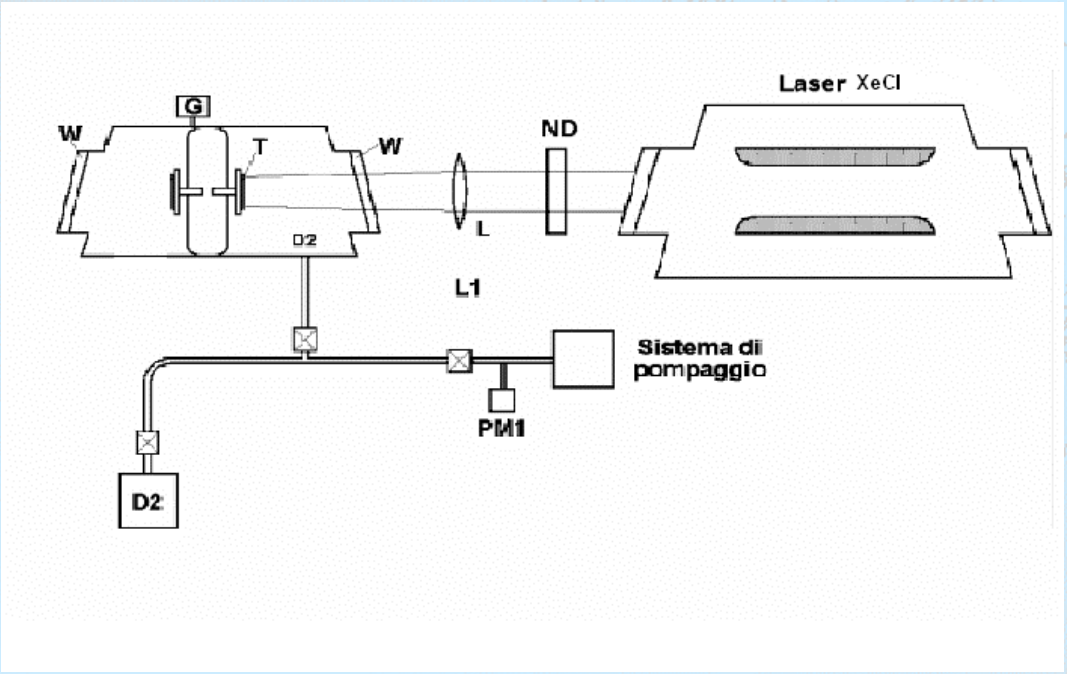


P implanted Pd

Energy = 150 keV

Experimental apparatus

Apparatus Sketch



D2: ***Deuterium gas cylinder***

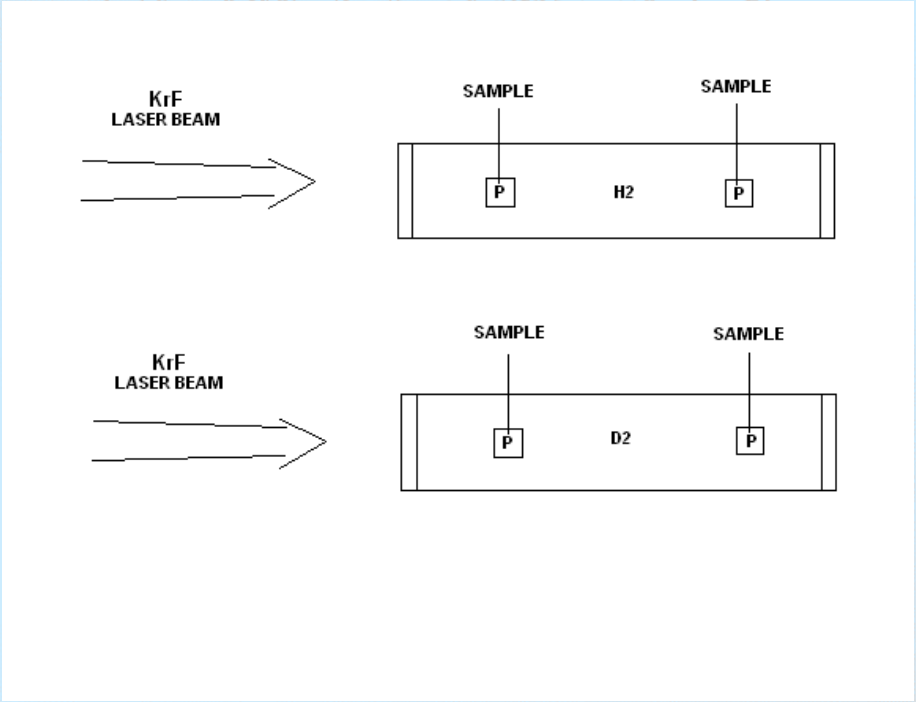
T: ***Target***

W: ***Quartz window***

L: ***Convergent lens***

Experimental apparatus

Experimental setup



Experimental apparatus

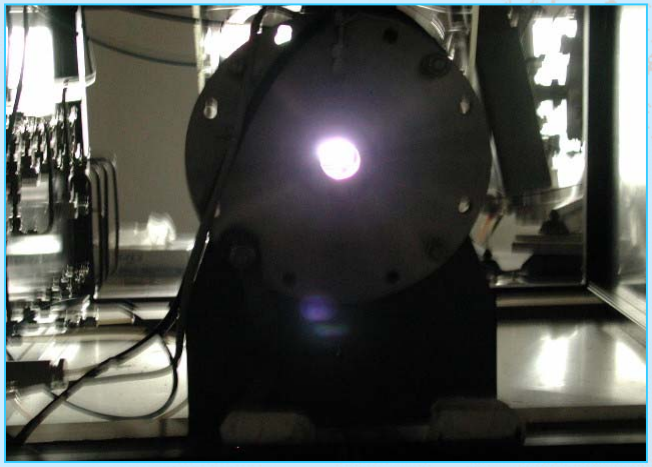
Laser characteristics

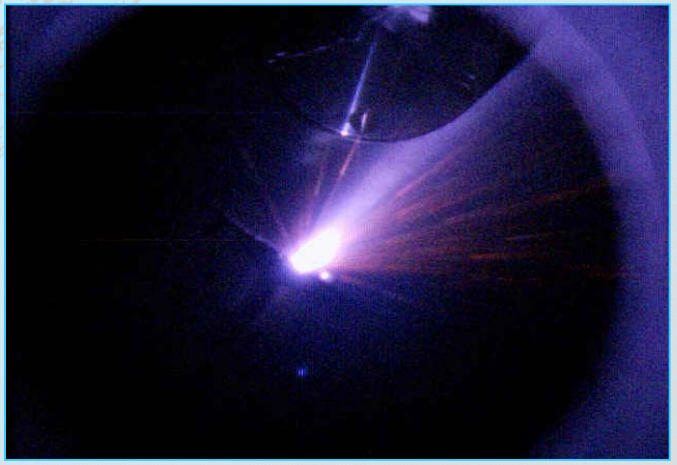
Type: ***KrF-248 nm***

Pulse width: ***20 ns***

Repetition rate: ***1 Hz***

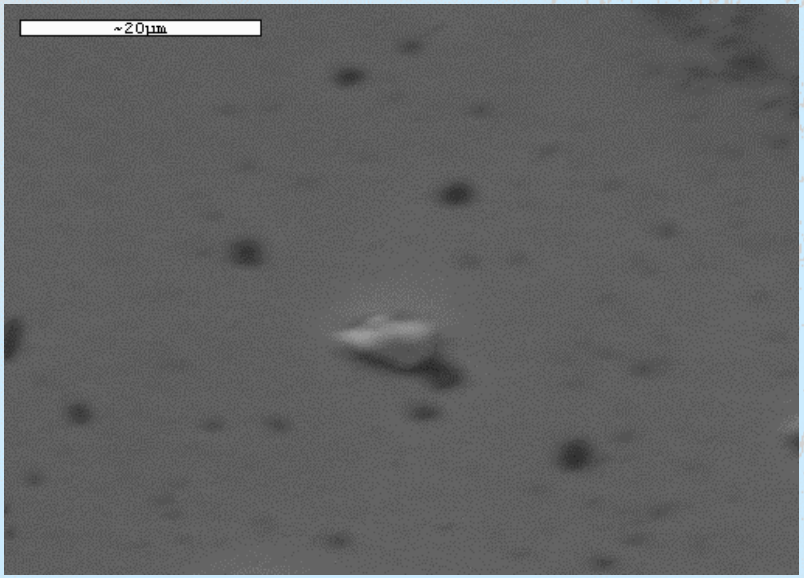
Laser fluence: ***25mJ/cm²***



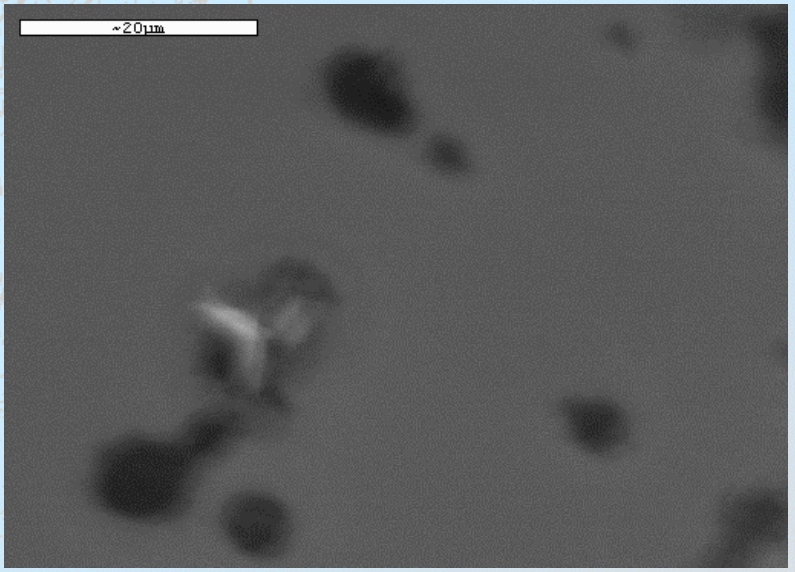


Samples Analysis

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



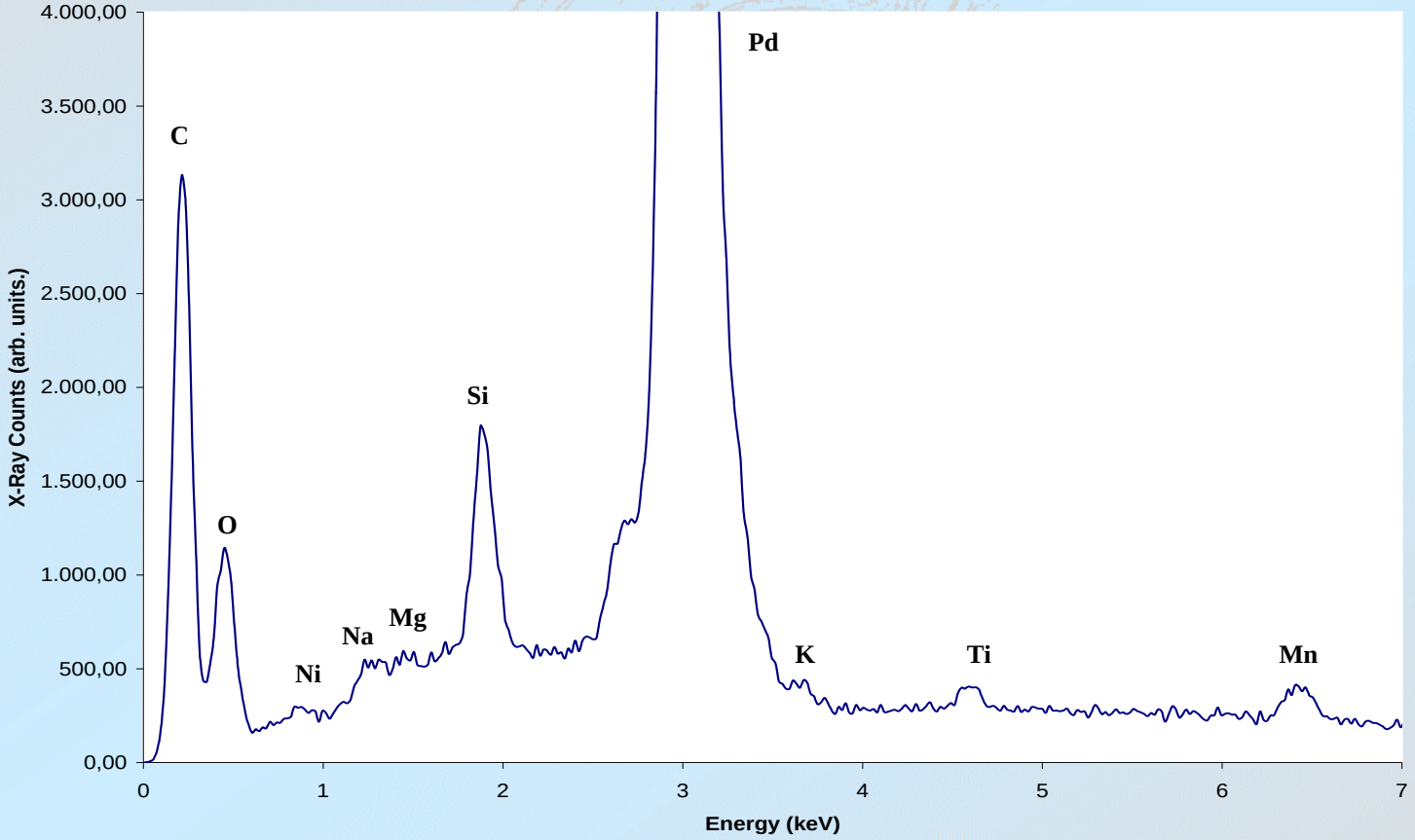
SEM micrograph of sample processed with H_2 gas and KrF laser



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 H2

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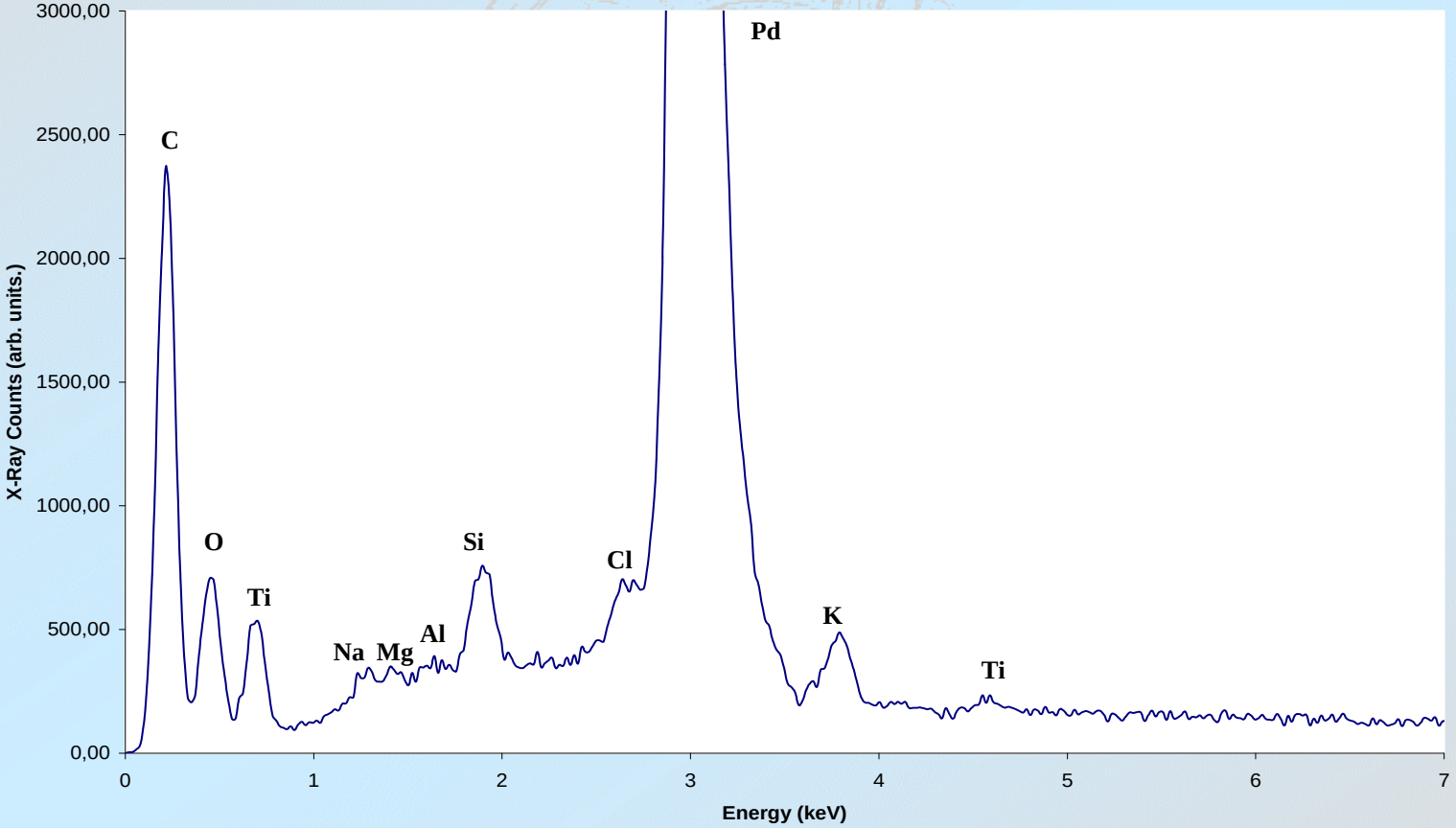
EDX Analysis

EDX spectra of samples loaded with D_2 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	Al
	Cr	S	K
	Fe	Ca	Ca
	Ni	K	Mg
	Al	Mg	
	S		
	K		
	P		
	Co		
	Mn		

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.