

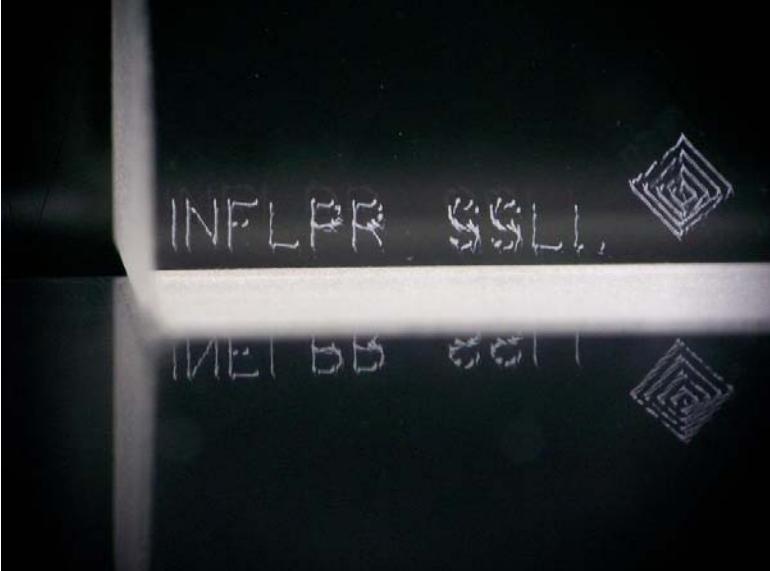


Seminarul National de nanostiinta si nanotehnologie

16 martie 2010

Ablatia filmelor subtiri de tip multistructura Co/Cu/Co cu laseri cu durata de pulsa ultrascurta (fs)

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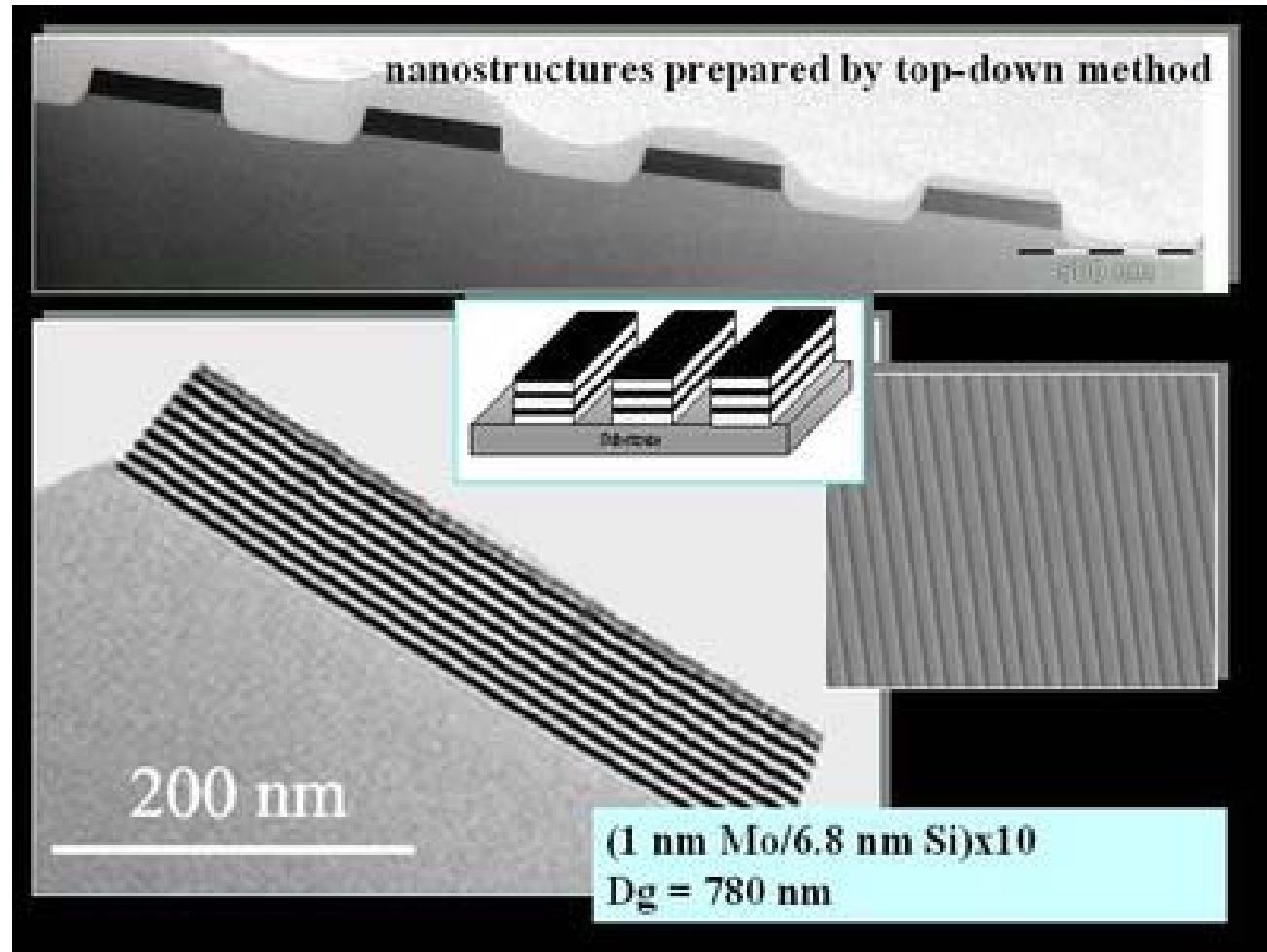


A grayscale micrograph showing two distinct regions of a thin film. The upper region displays a complex, nested multi-layered structure, likely the ablated area. The lower region shows a smoother surface with some texture, possibly the unmodified substrate or a different part of the sample. The text "INFLPR SSLL" is visible in the background of the image.

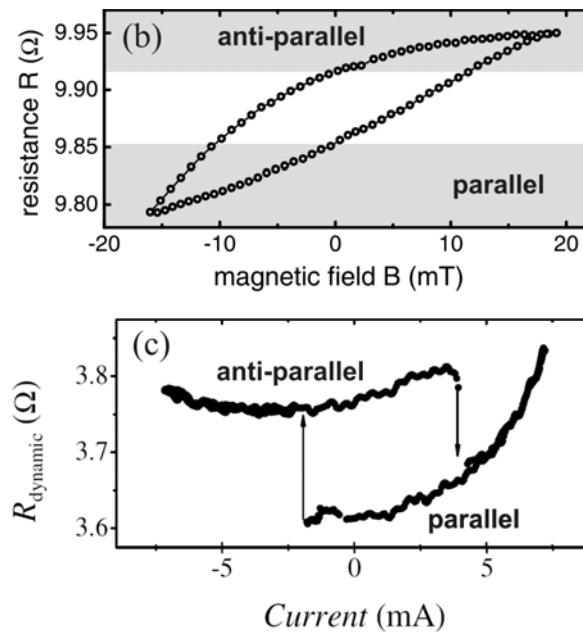
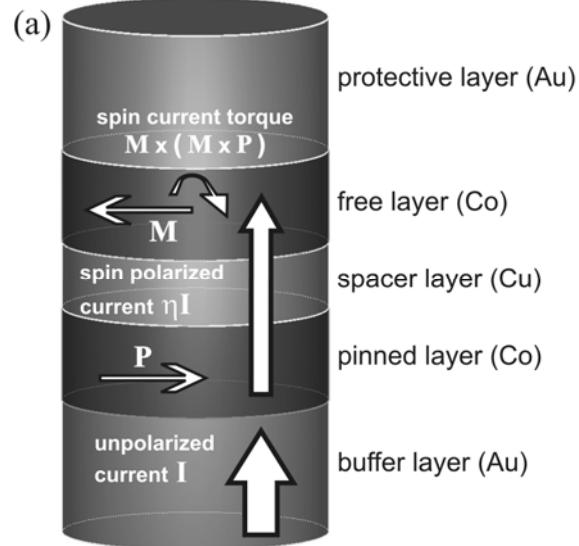
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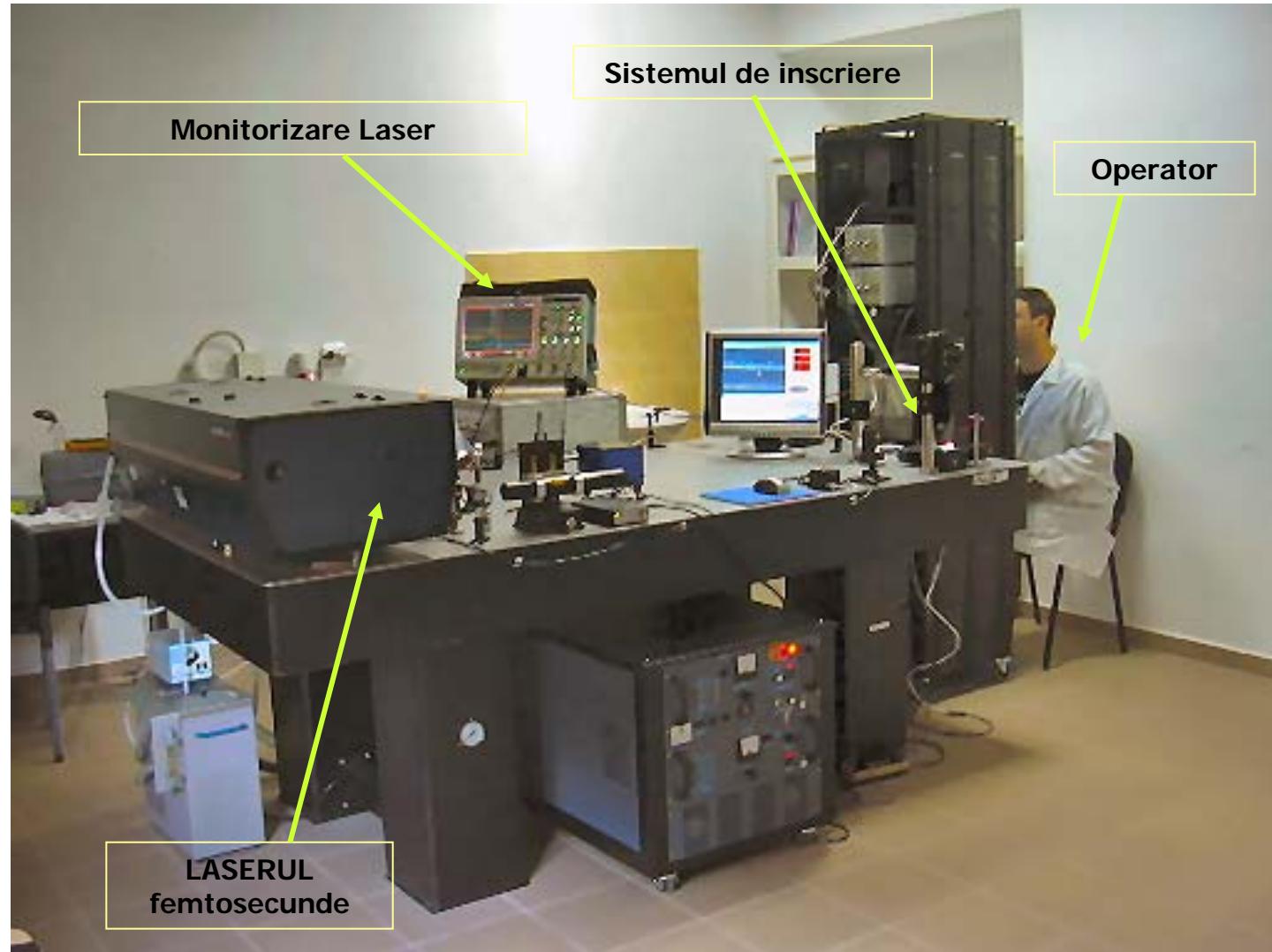


MNT-Eranet “Nanostructuri pentru spintronica si alte aplicatii”
Institutul de fizica al Academiei de Stiinte a Slovaciei

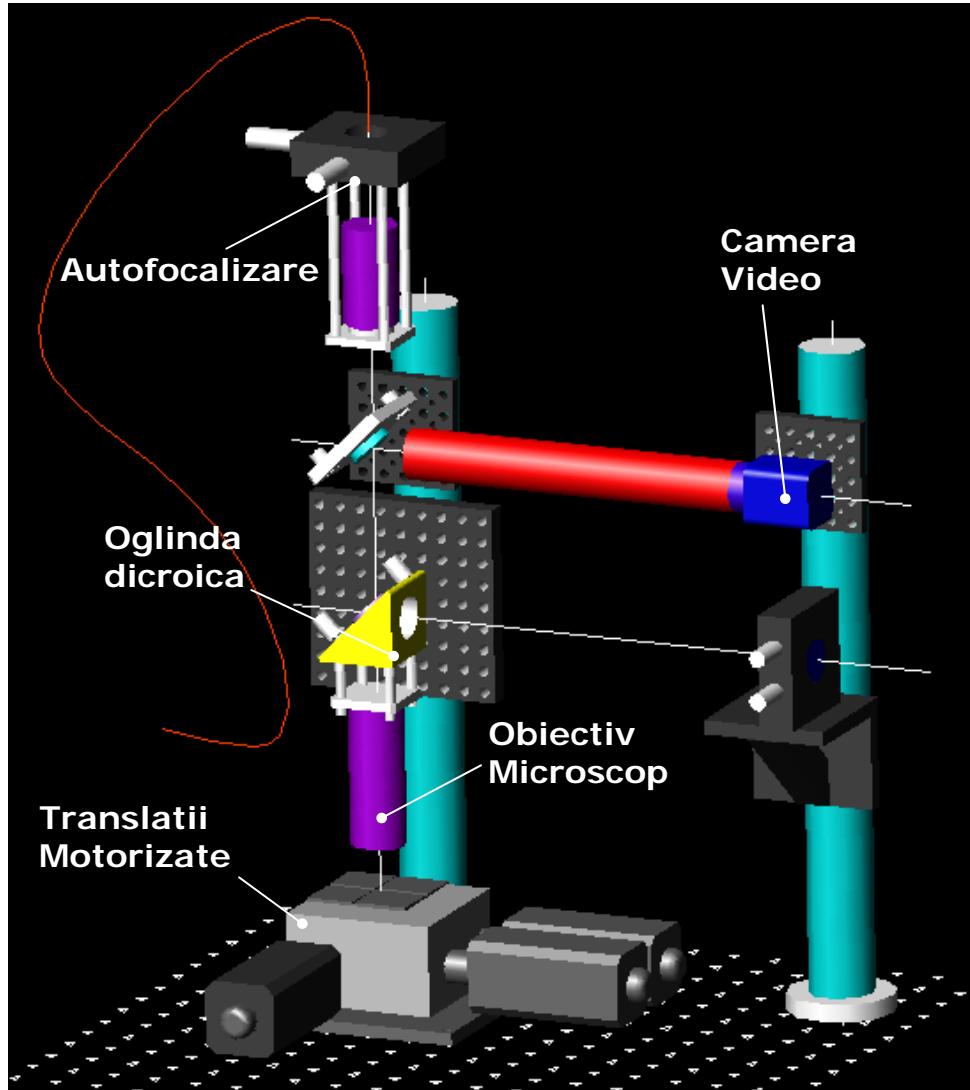


Principiul unei vale de spin GMR realizate de grupul
Institutului de Fizica al Academiei
de Stiinte a Slovaciei

Sistemul experimental de scriere directă cu laserul fs (DLW)



Sistemului opto-mecanic pentru DLW (1)



LASER

- durata de puls 180 fs
- lungimea de unda 775 nm
- frecventa 2 KHz

Obiectiv de microscop

- apertura numerica 0.5NA
- marire 100X
- distanta focala 2 mm

Translatii motorizate XYZ

- gama de deplasare $(4 \text{ mm})^3$
- pas 100 nm
- precizie 400 nm

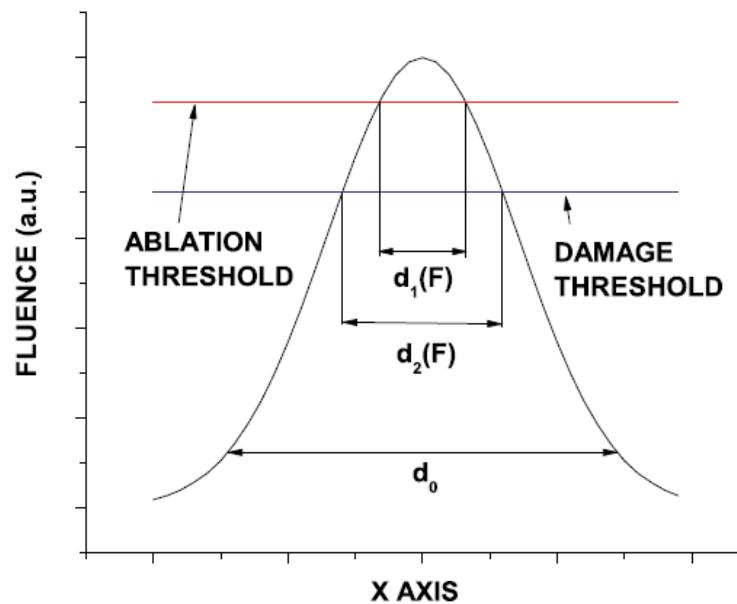
Translatii Piezo XYZ

- gama de deplasare $(20 \mu\text{m})^3$
- precizie 5 nm (senzor)

Vizualizare

- camera 768 x 494 pixeli
- lentila 200 mm

Procesari cu fascicule laser Gaussiene



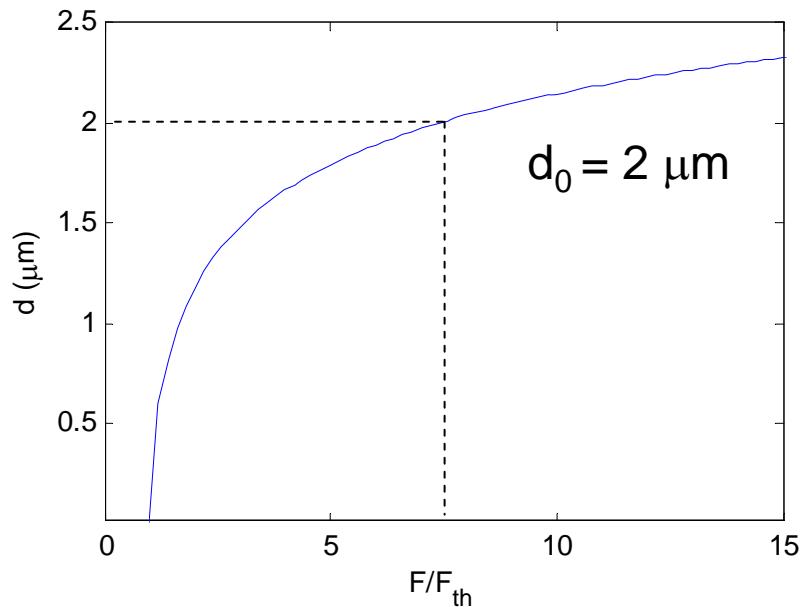
Procesarea materialelor prin ablatie laser se poate face cu precizie sub limita de difractie prin ajustarea corespunzatoare a fluentei laser.

$$d_0 = \frac{2M^2\lambda}{\pi AN} \approx \frac{\lambda}{AN}$$

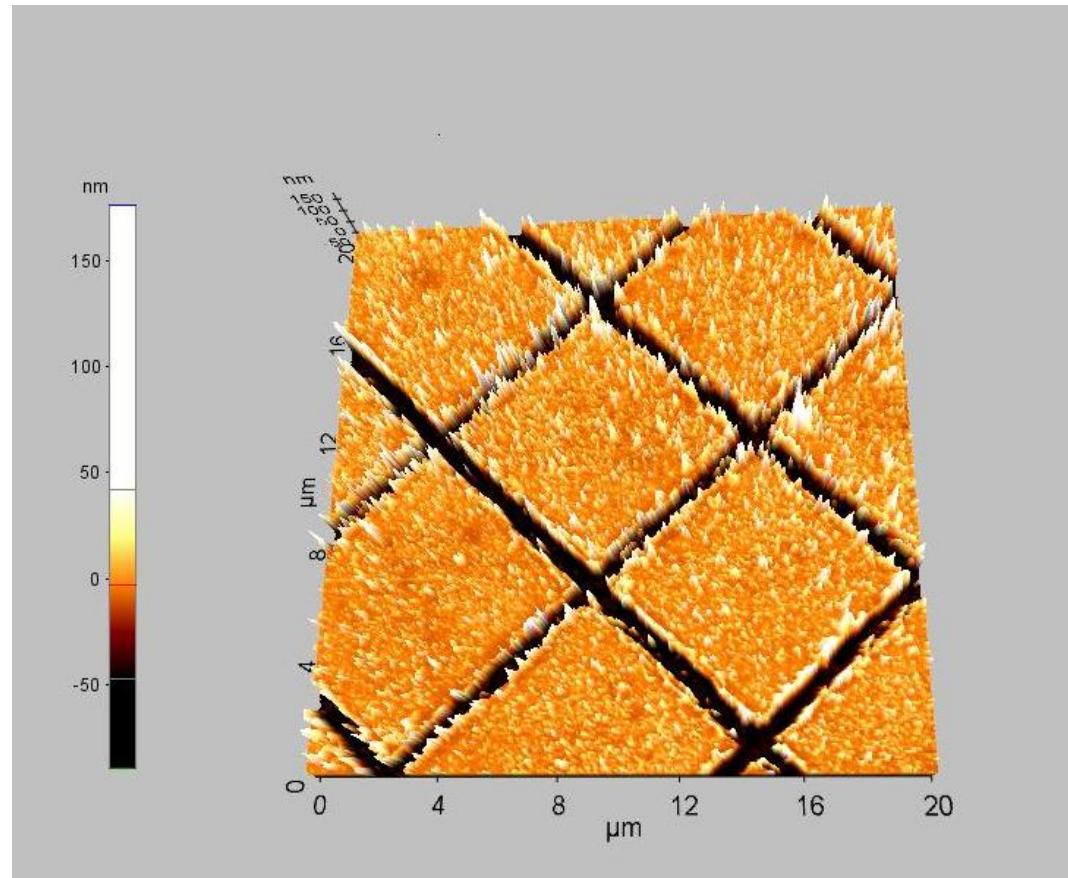
d_0 – diametrul minim al spotului laser focalizat

AN – apertura numérica

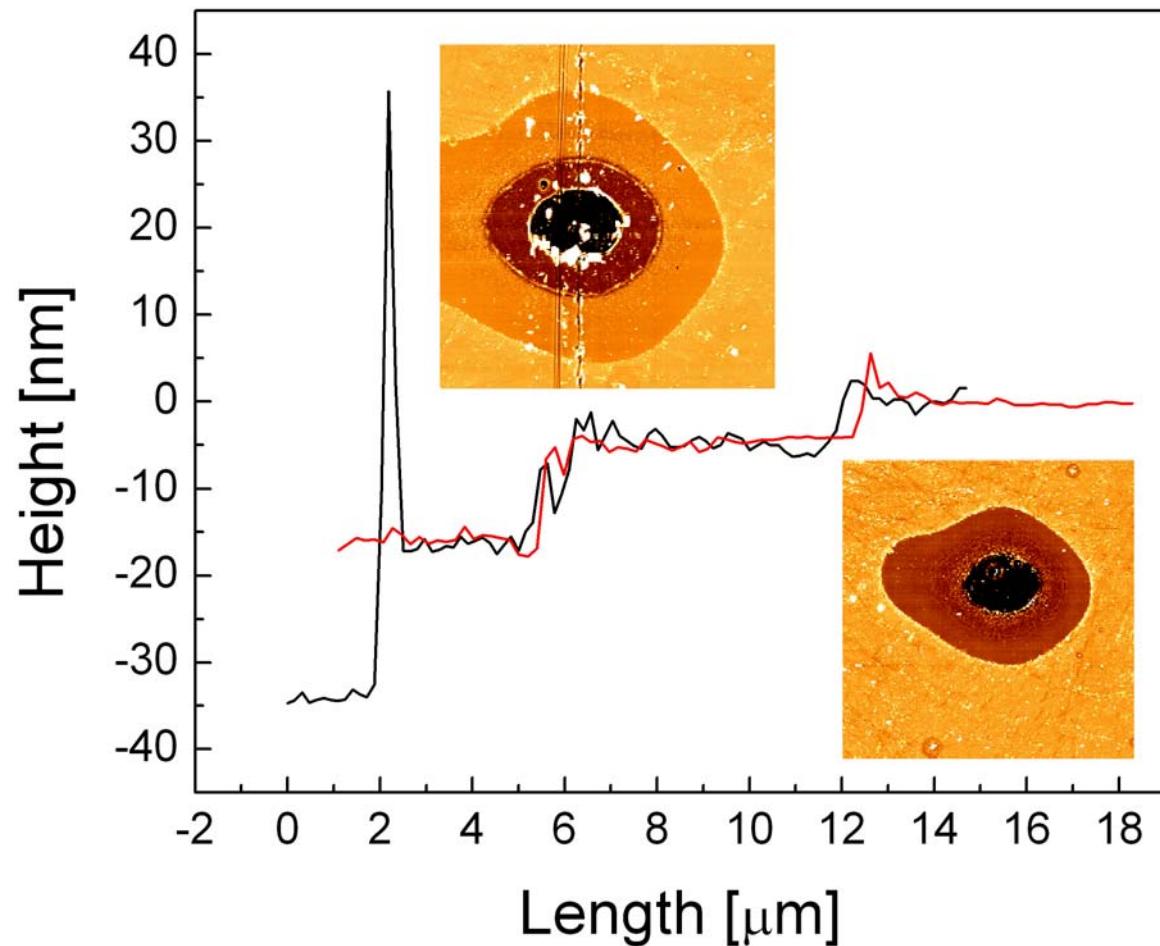
$$d(F) = \frac{d_0}{\sqrt{2}} \sqrt{\ln(F/F_{th})}$$



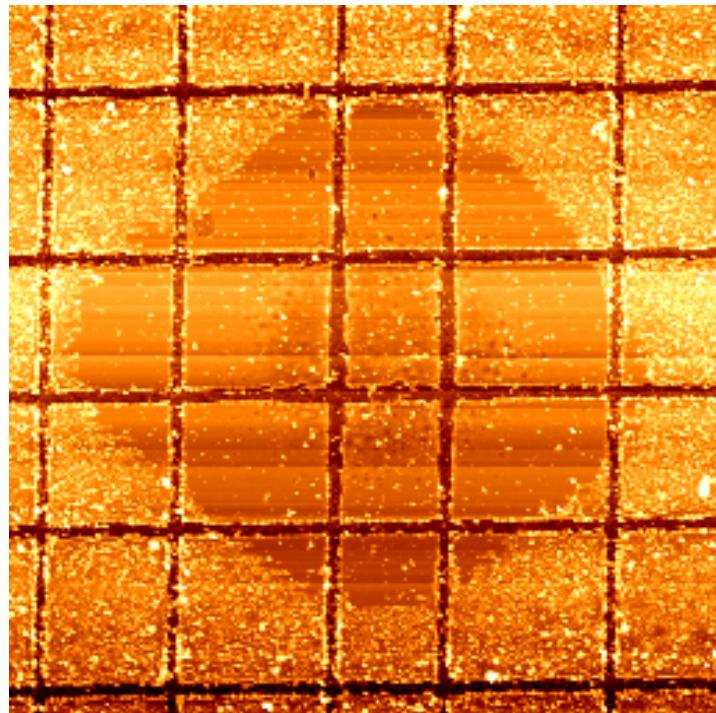
Substrat Si/SiO₂/Co 20 nm/Cu6nm/Co3nm



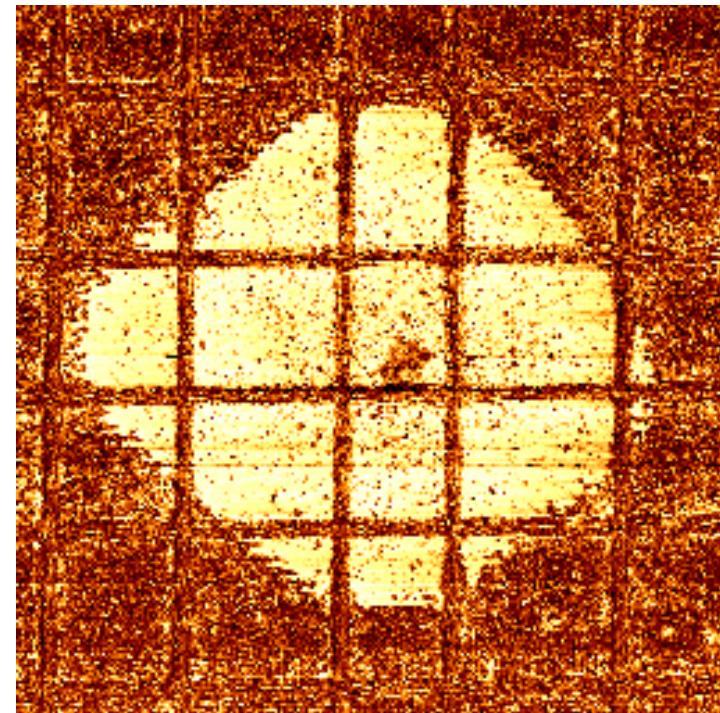
Ablatia laser a unei multistructuri Co/Cu/Co



Microscopie de forta atomica

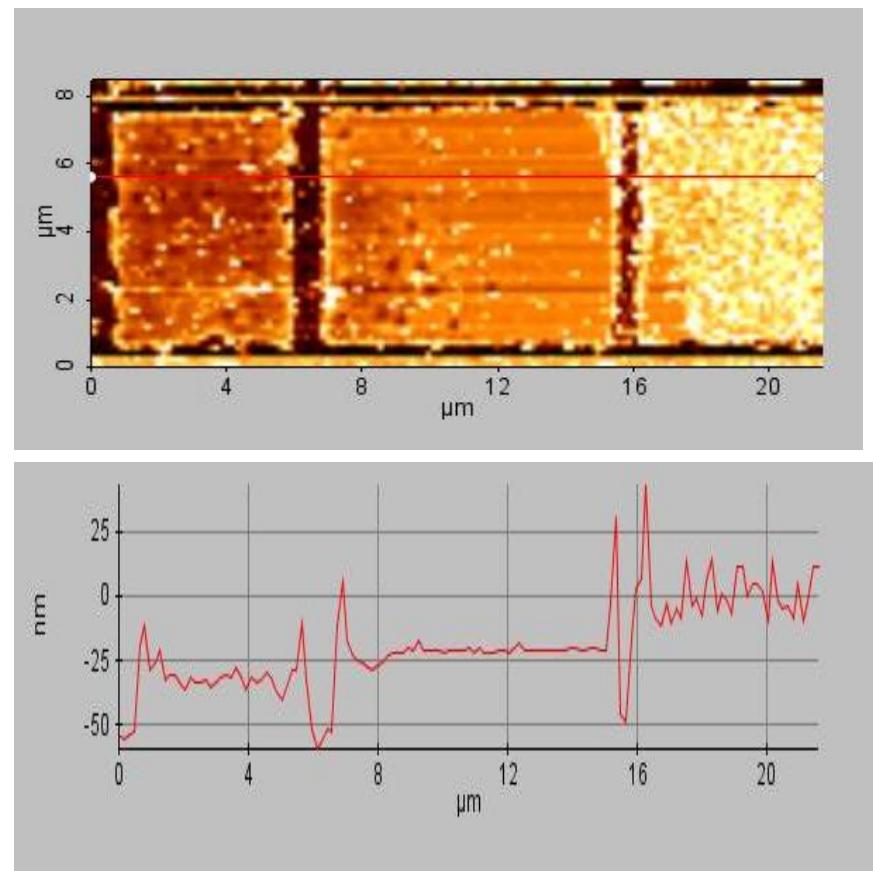
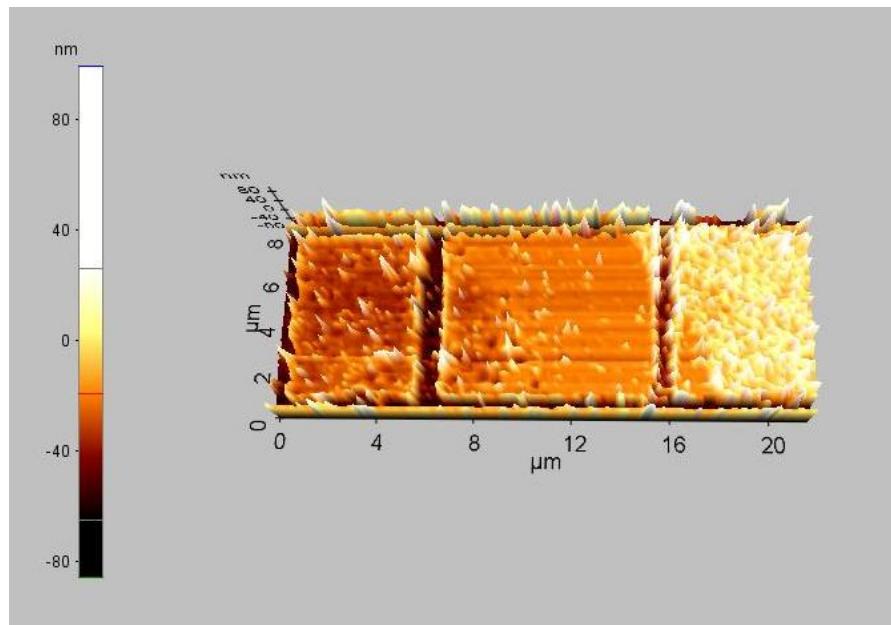


AFM – topografie

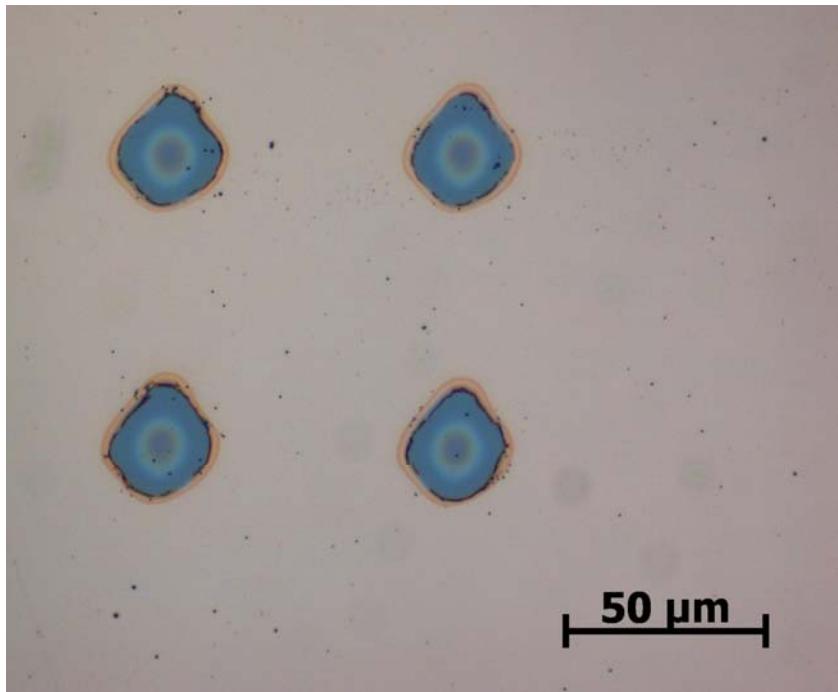


AFM – diferență de fază

Litografie cu laserul cu femtosecunde

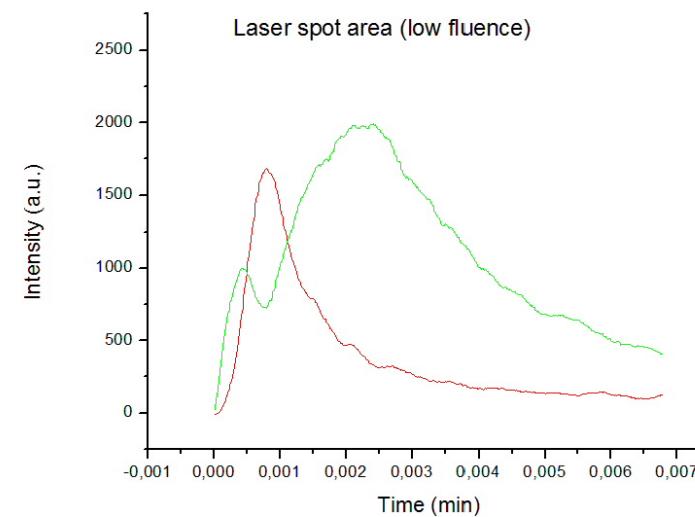
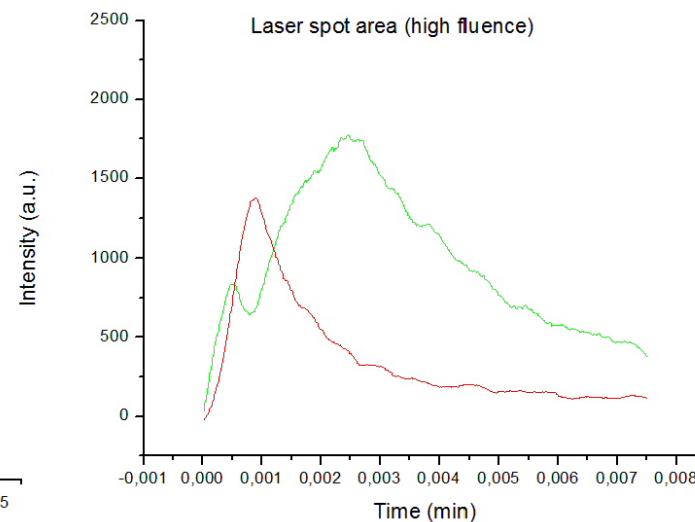
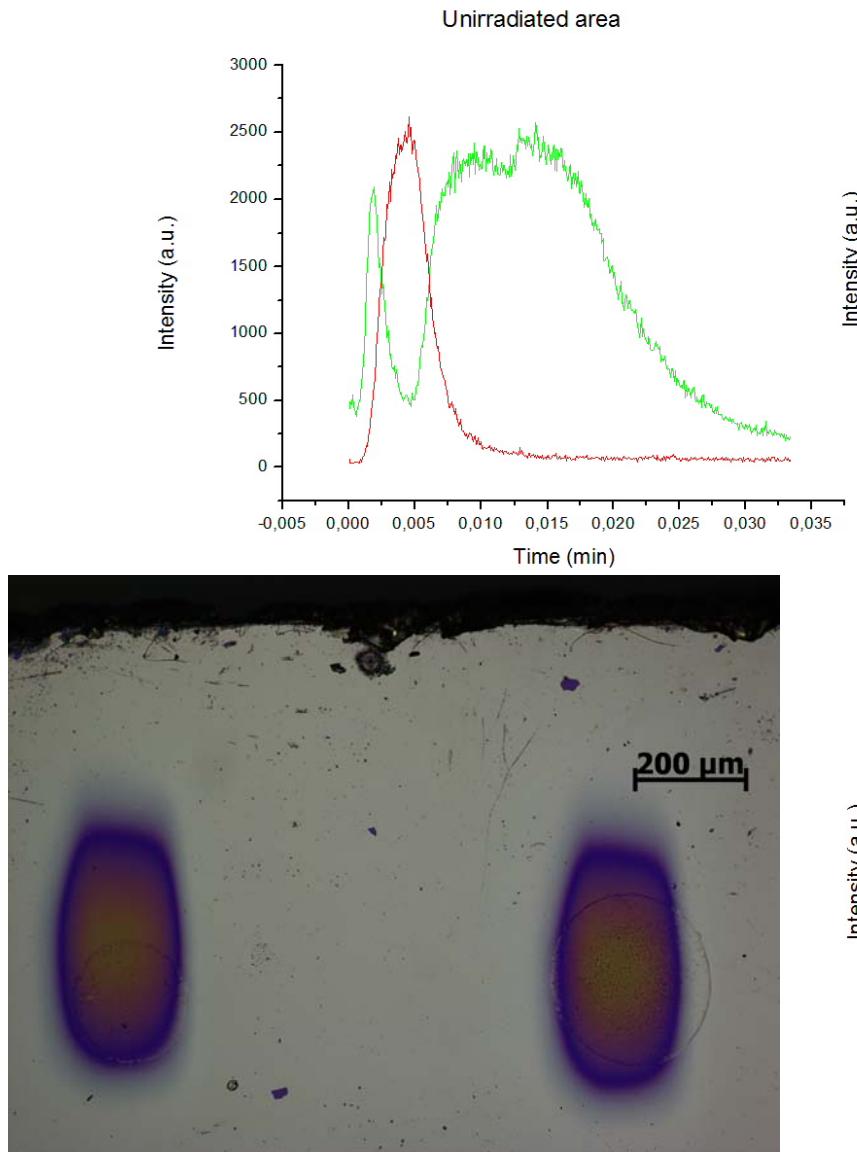


Praguri ablatie Co si Cu



	Cupru	Cobalt
$\rho(\text{kgm}^{-3})$	8960	8900
$L(10^5 \text{Jkg}^{-1})$	2.05	2.74
$T_m(\text{K})$	1358	1768
$T_v(\text{K})$	2833	3200
$K_s(\text{Wm}^{-1}\text{K}^{-1})$	397	100
α_s	115	27
$k_l(\text{Wm}^{-1}\text{K}^{-1})$	170	30
$\alpha_l(10^{-6}\text{m}^2\text{s}^{-1})$	43	6.1
$E_{th} (\mu\text{J})$	0.6	5

Masuratori SIMS



Masuratori SIMS

