


Prof. Dante F. Franceschini

IF/UFF: CAIPE, LPN, LAMAR, LCM
PPGEQ, PPGIO

Produção, caracterização e
aplicações de nanomateriais



10nm JEOL 2/4/2016
00 15.0kV BED-C SEM WD 8.3mm 18:01:08



Formação	Colocação Profissional	Ano
Bacharelado em Física PUC-RIO		1977
Mestrado em Física CBPF		1984
	CBPF	1979-1984
	Petroflex	1985-1989
	Petroquisa	1990-1992
	Petroflex	1992-1994
	Origin	1994
Doutorado em Engenharia Metalúrgica e de Materiais-COPPE		1994
	PUC-RIO	1994-1996
	UENF	1996
	UFF	1996-?



Grupo de Nanomateriais

nanomat.if.uff.br



Laboratório de Preparação de Nanomateriais

Pulse Laser Deposition
(PLD)/ MBE - equipado com
RHEED



PLD simples



PECVD (PlasmaEnhanced
Chemical Vapor Deposition)
1 / 2

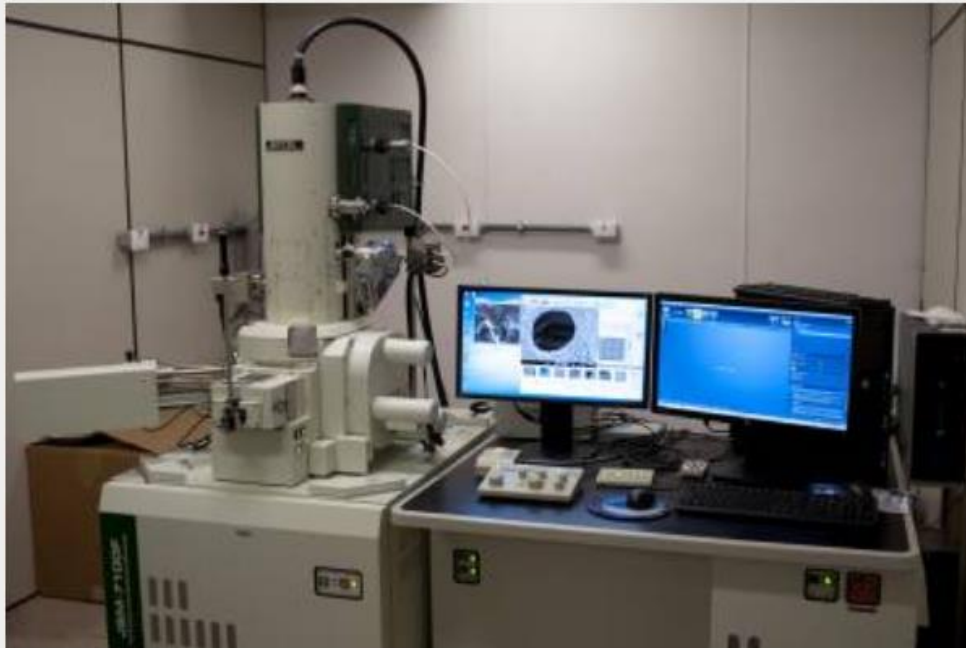
PLD em líquido

CAIPE – Centro de Caracterização Avançada Para a Indústria de Petróleo

- Microscópio Eletrônicos (MEV e MET) de Alta Resolução
- Espectrômetro de Fotoelétrons de Raios X (XPS) (Recat)
- Espectrômetro de Raman
- Analisador de Tensões por Difração de Raios X (LAT)

Laboratório de Microscopia Eletrônica de Alta Resolução (LAMAR/CAIPE)

Microscopia Eletrônica de Varredura (MEV)



JEOL JSM 7100F

Electron source: Field Emission

Working voltage: 100 V to 30 kV

EDS Detector: SDD

STEM

Laboratório de Microscopia Eletrônica de Alta Resolução (LAMAR/CAIPE)

Microscopia Eletrônica de transmissão (MET)



JEOL JEM 2100F

Electron source: Field Emission

Working voltage: 80 kV and 200kV

EDS Detector: SDD

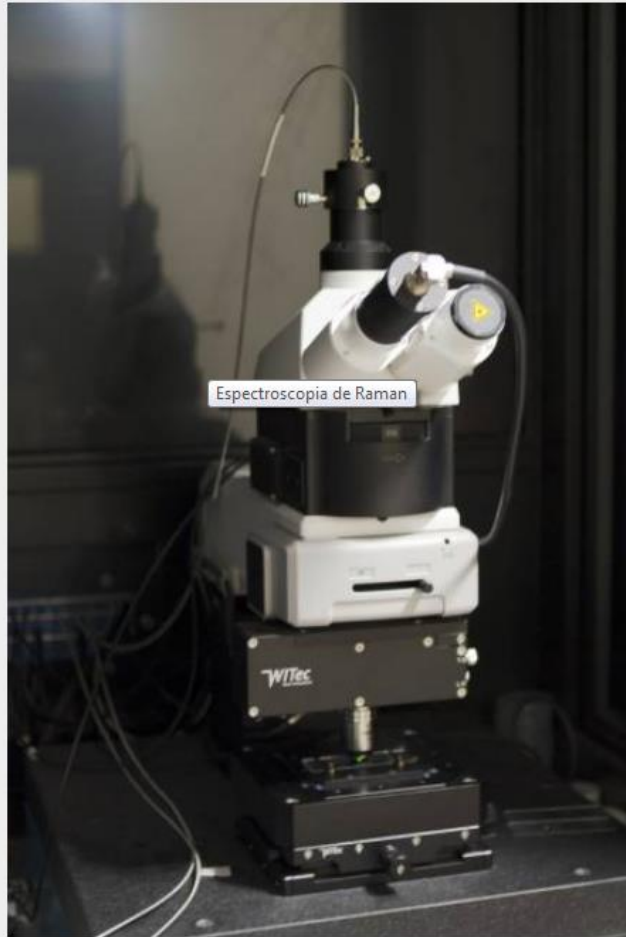
STEM

HAADF detector

EELS

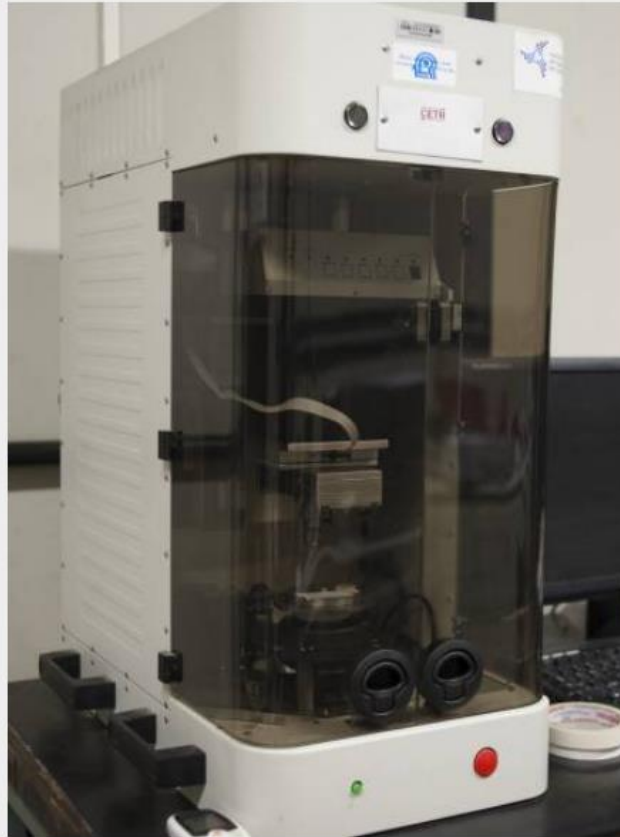
Laboratório de caracterização de Materiais (LCM/ CAIPE)

Espectroscopia de Raman

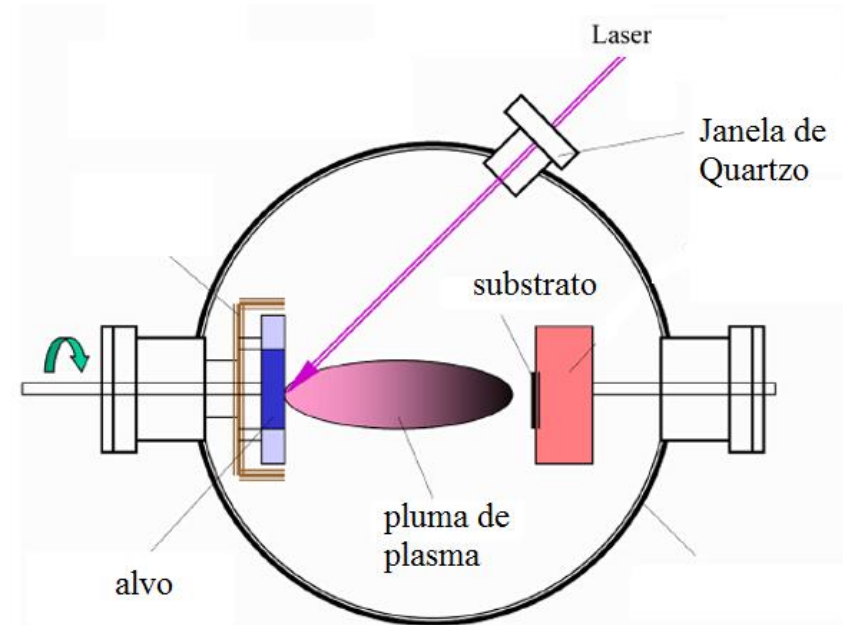
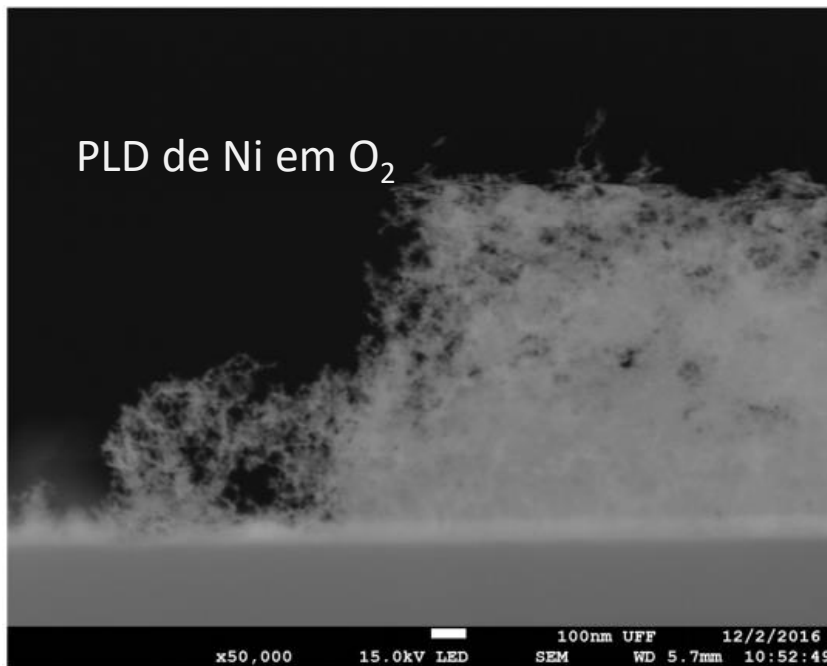
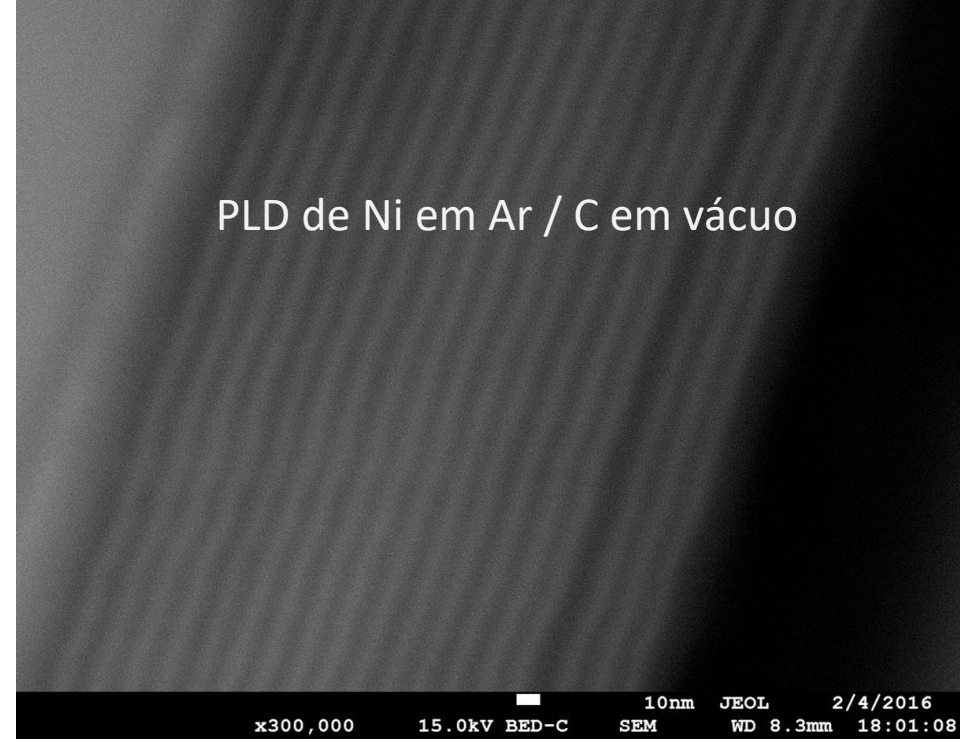
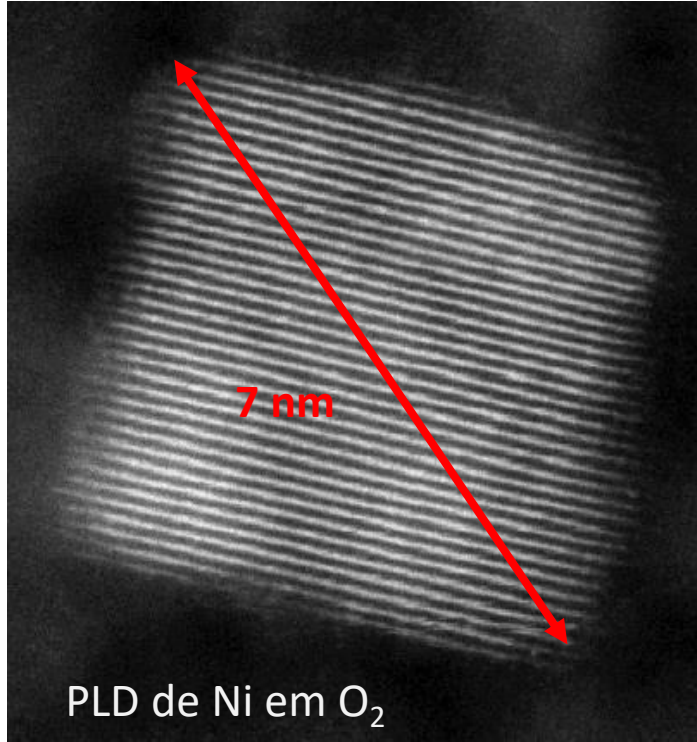


Witek Alpha 300 R

Tribometro



Tribometro Brucker



Graphene Grown by Chemical Vapour Deposition on Steel Substrates: Friction Behaviour

E. C. Romani¹ · D. G. Larrude² · L. Nachez³ · C. Vilani⁴ · J. B. de Campos⁵ ·
S. B. Peripolli^{5,6} · F. L. Freire Jr.¹

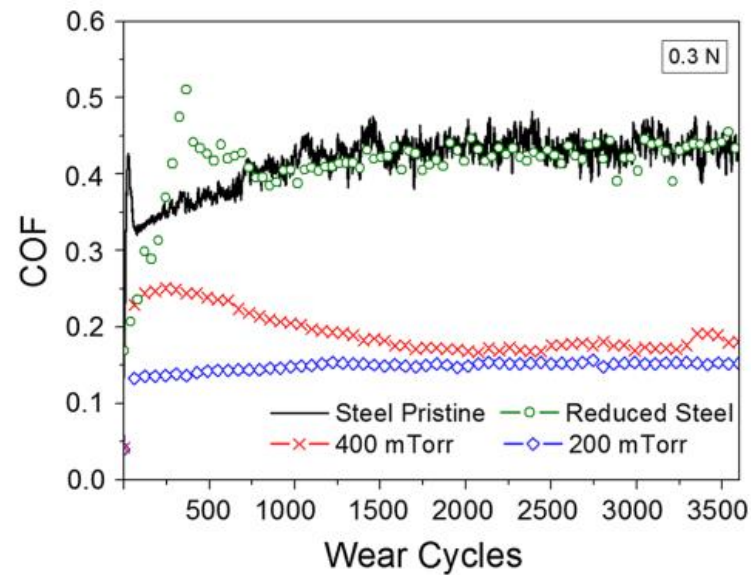


Fig. 4 Coefficient of friction (COF) measured at a load of 0.3 N for different sliding pairs

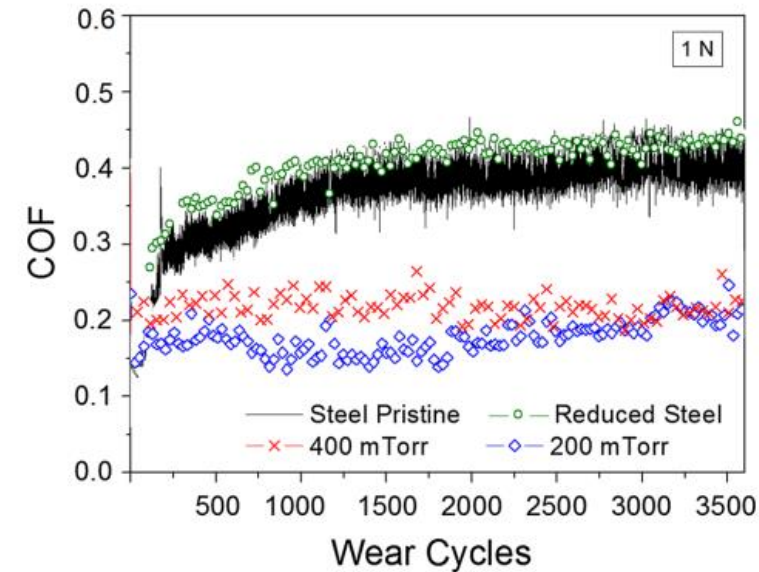


Fig. 5 Coefficient of friction (COF) measured at a load of 1 N

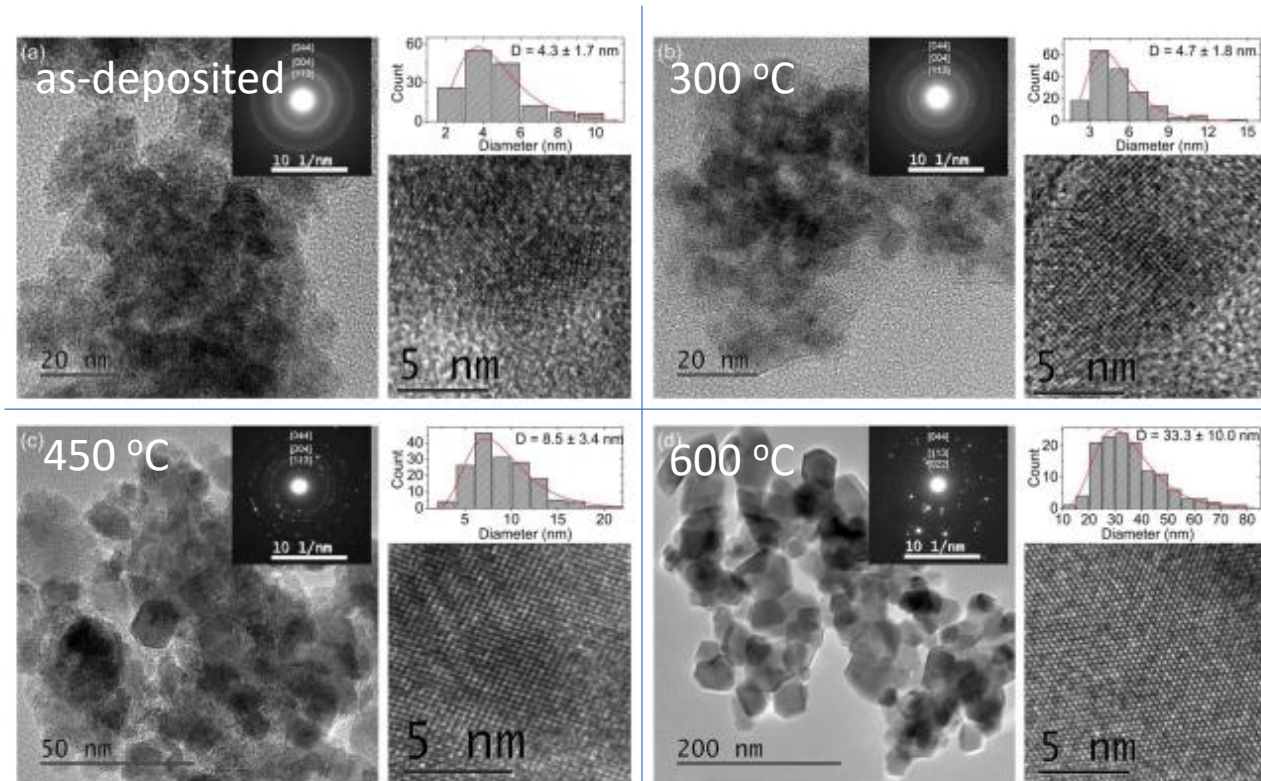
Effects of postdeposition heat treatment on the structural and magnetic properties of CoFe₂O₄ nanoparticles produced by pulsed laser deposition

F. Fabris,^{1,a)} Y. T. Xing,¹ D. F. Franceschini,¹ D. R. Sanchez,¹ M. Alzamora,²
and W. C. Nunes^{1,b)}

¹Instituto de Física, Universidade Federal Fluminense, 24210-346 Niterói, Rio de Janeiro, Brazil

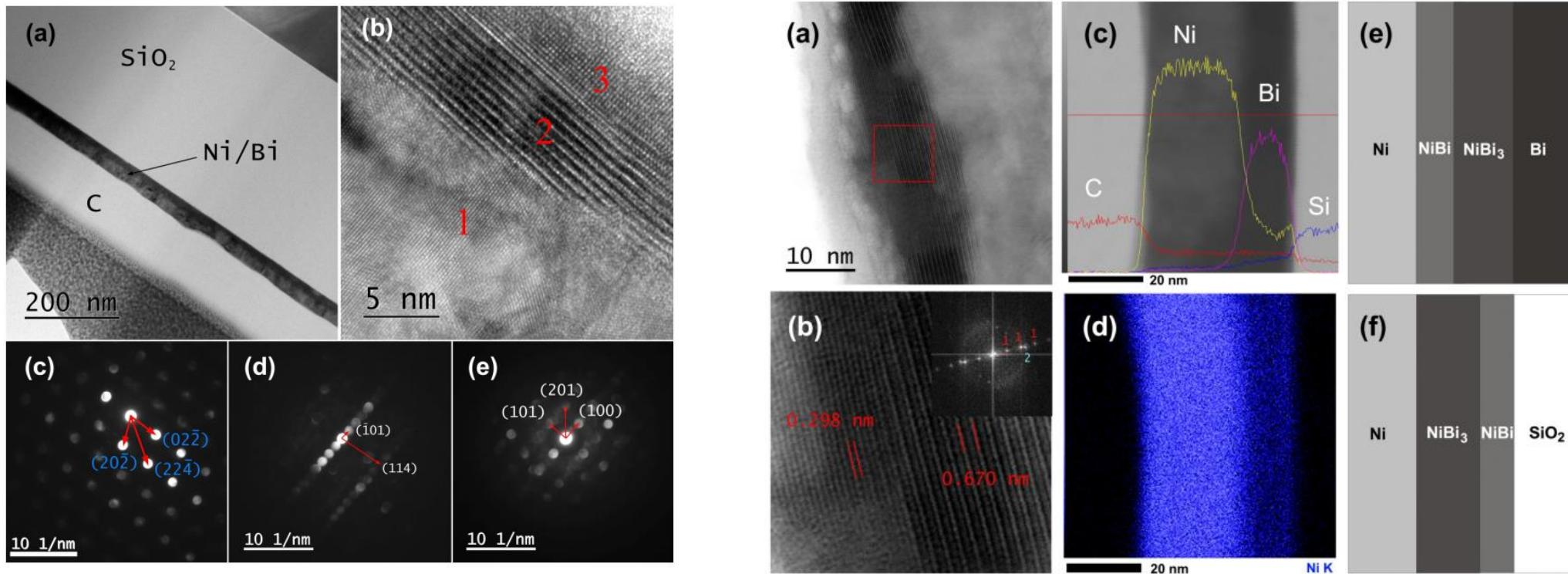
²Universidade Federal do Rio de Janeiro, 25245-390 Duque de Caxias, Rio de Janeiro, Brazil

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Superconductivity in Bi/Ni bilayer system: Clear role of superconducting phases found at Bi/Ni interface

L. Y. Liu,¹ Y. T. Xing,^{2,*} I. L. C. Merino,³ H. Micklitz,³ D. F. Franceschini,² E. Baggio-Saitovitch,³ D. C. Bell,^{4,5} and I. G. Solórzano¹



Bi₃₈Ni₄₀

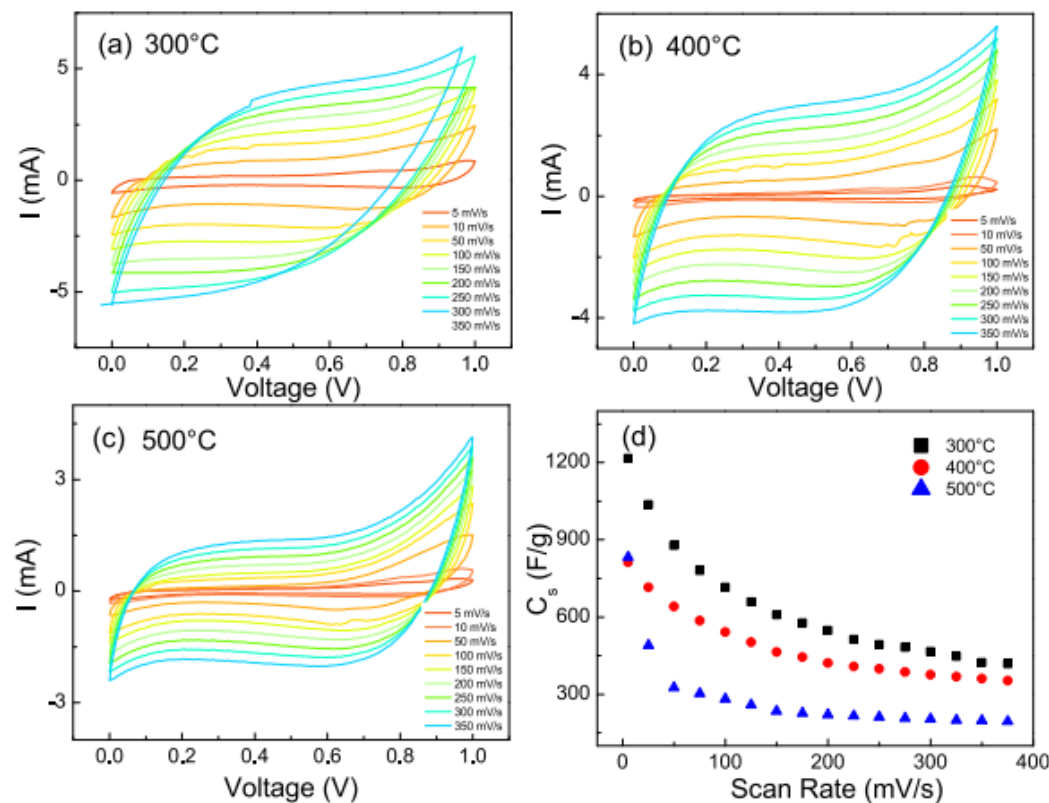
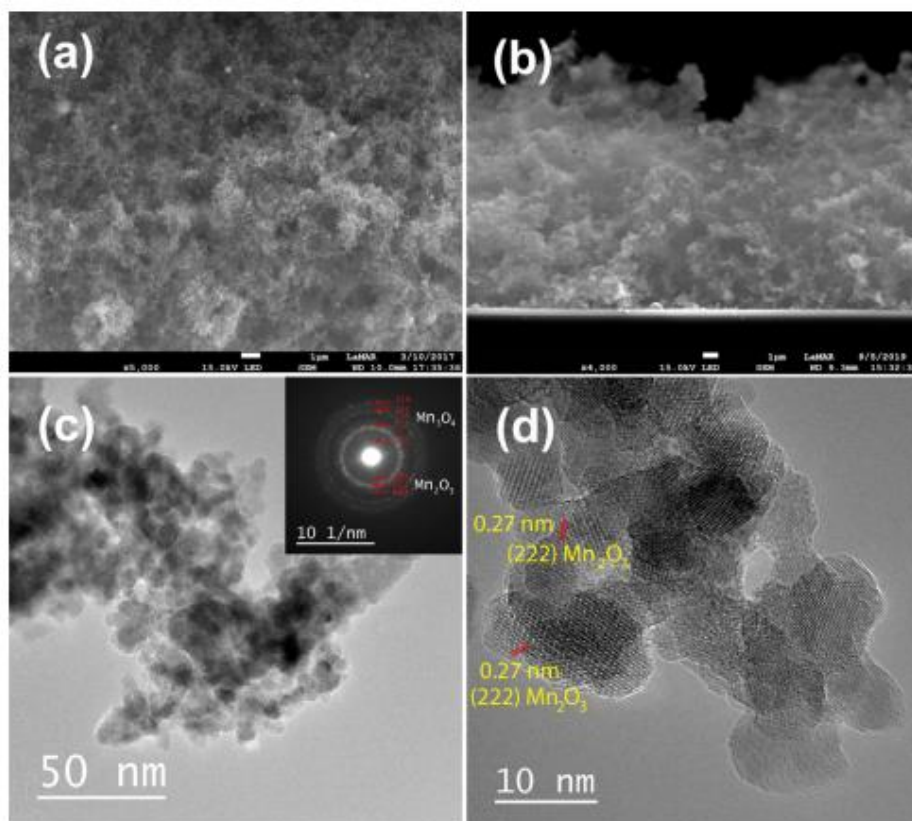


Manganese oxide nanofoam prepared by pulsed laser deposition for high performance supercapacitor electrodes

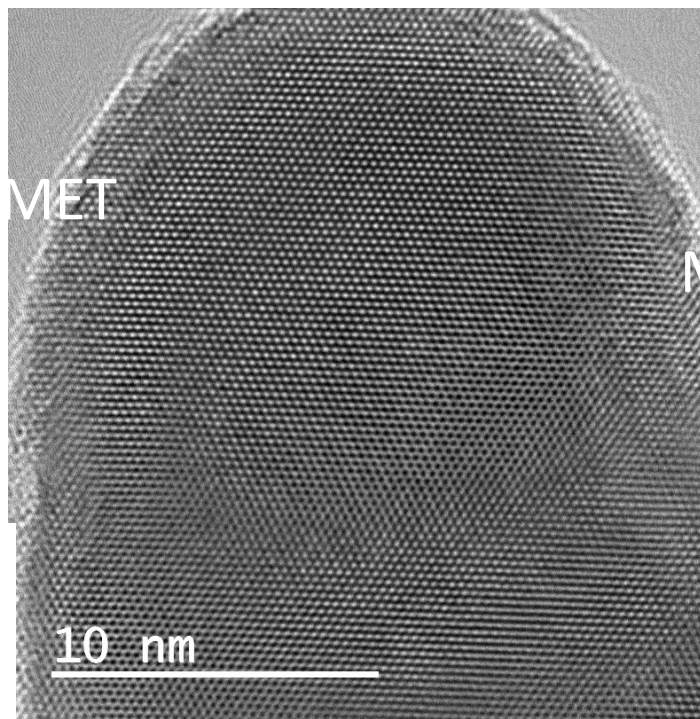
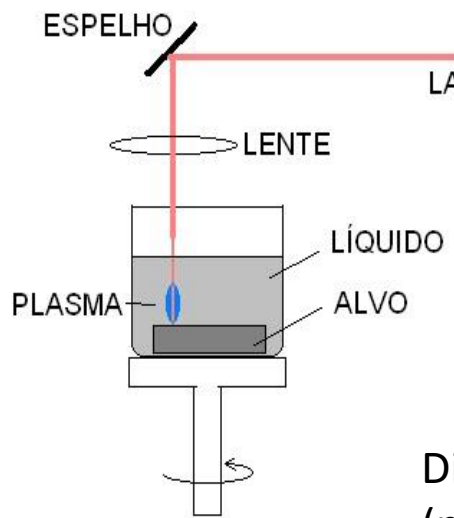
J.N. Lacerda^a, D.F. Franceschini^{a,b}, E.A. Ponzio^{a,c}, Laura M. Esteves^a, R.B. Guimarães^b, Y.T. Xing^{a,b,*}

^a Departamento de Engenharia Química e de Petróleo, Universidade Federal Fluminense, 24210-346, Niterói, Brazil

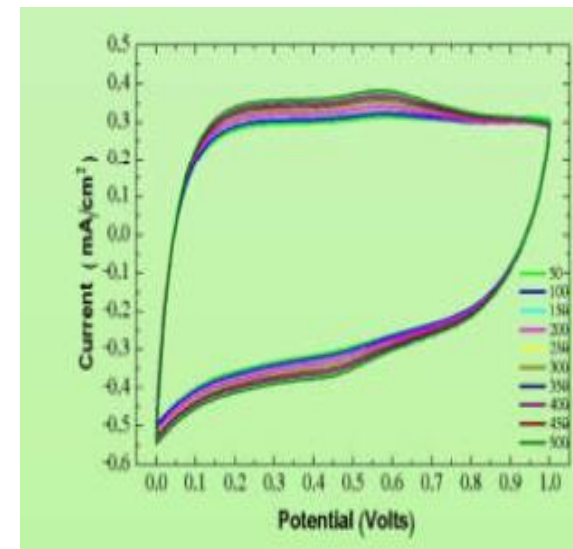
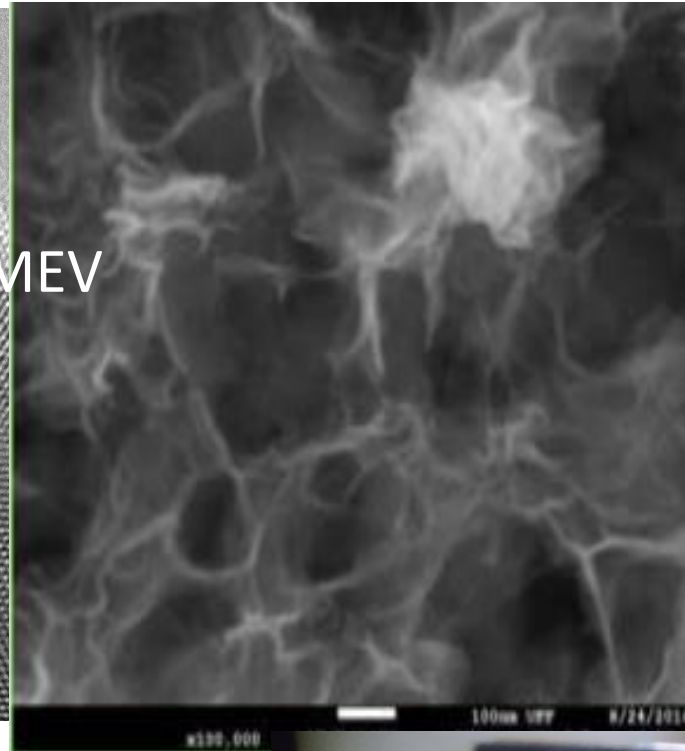
^b Instituto de Física, Universidade Federal Fluminense, Rio de Janeiro, Br 41, Brazil



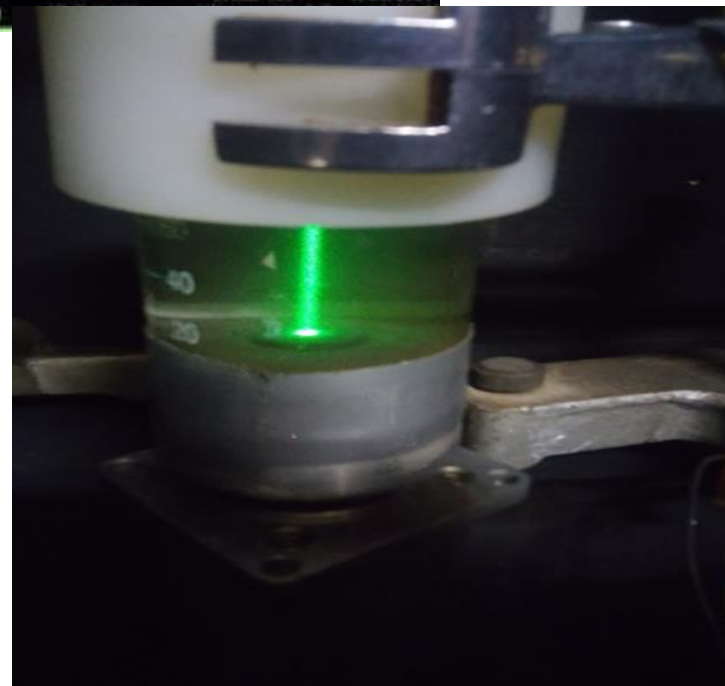
Nanofolhas de Mn_3O_4 Spinel cúbico PLD de MnO_2 Em H_2O



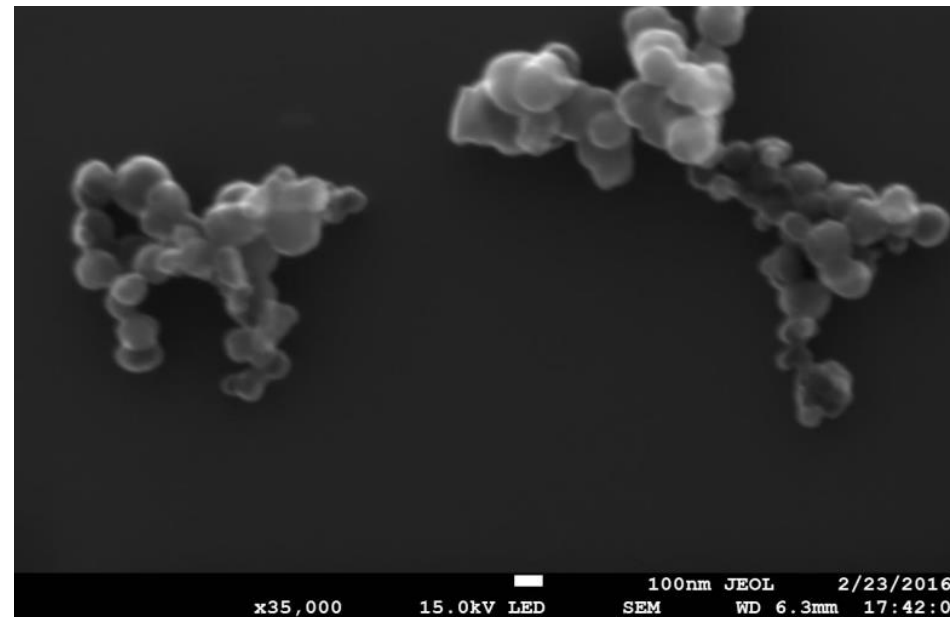
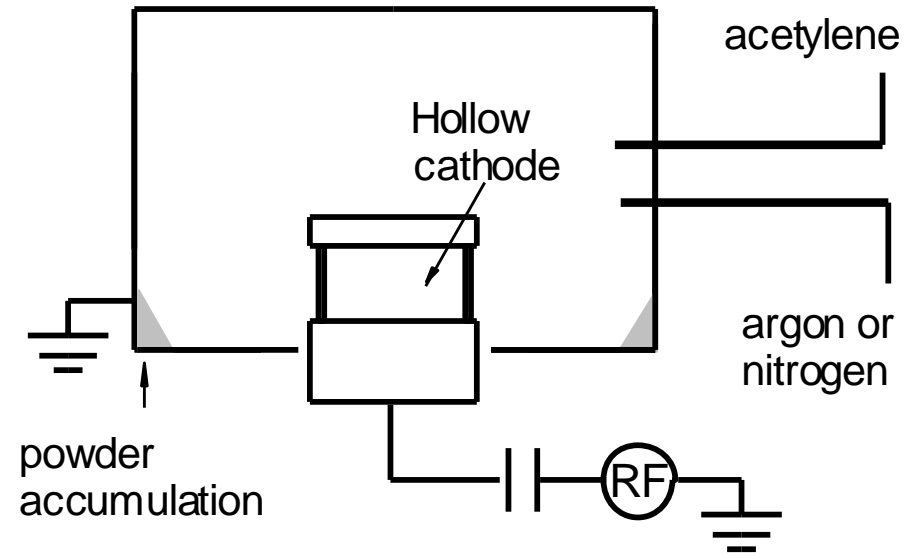
MEV



Dissertação de mestrado de André Drummond
(poster hoje)



Amorphous Hydrogenated Carbon (a-C:H) produced by Dusty Plasmas



Dissertação de mestrado de Clara Soares
Continuação IC Cauê Nogueira.

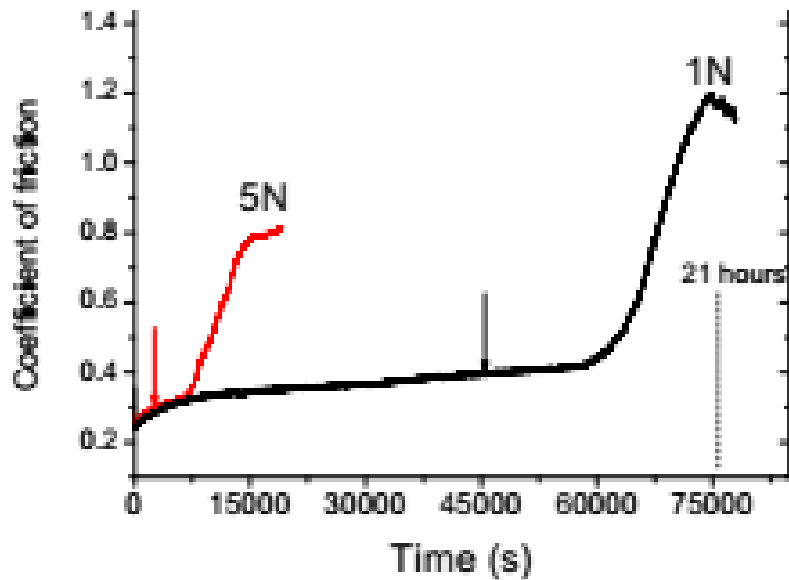


Tribological properties of RF-plasma-deposited diamond-like carbon coatings on nitrile rubber.

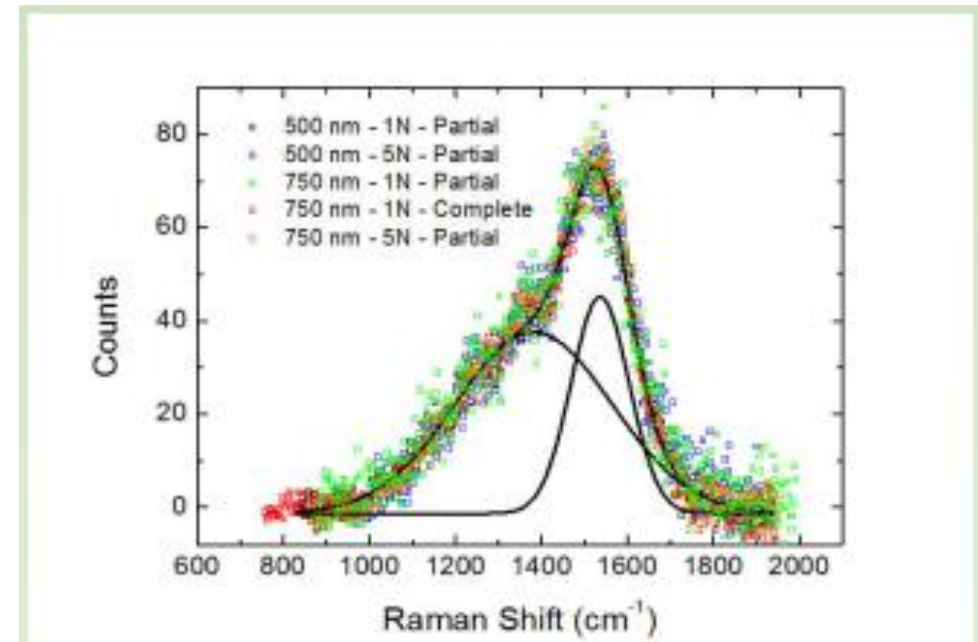
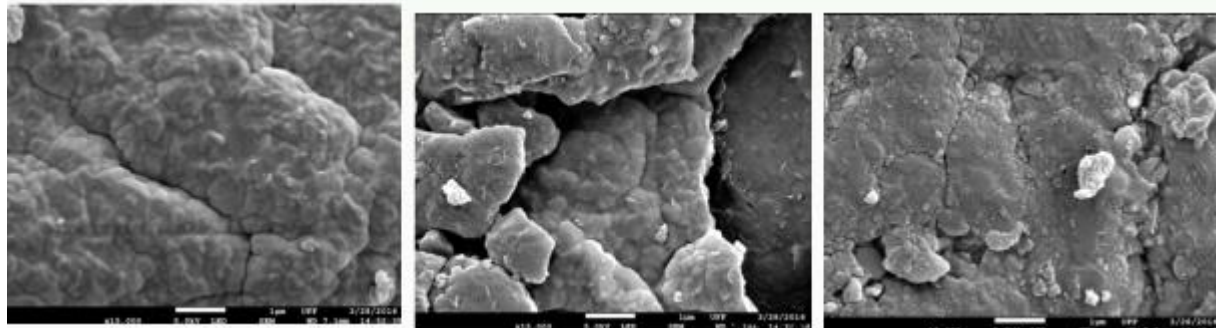
Marcelo Evers, Alessandro S.E. Cruz, Yutao Xing, J. Lucas Nachez,
Dante F. Franceschini

Instituto de Física, Universidade Federal Fluminense

J - P 1.48



Dissertação de Mestrado. Prog. Eng. Química, 2015



Mecanismo de desgaste de
filmes DLC depositados sobre
substratos de borracha nitrílica

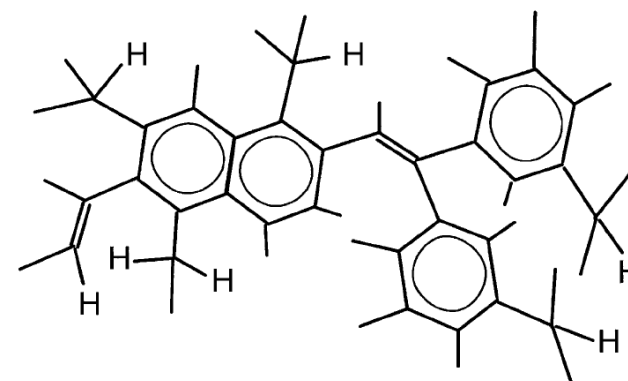
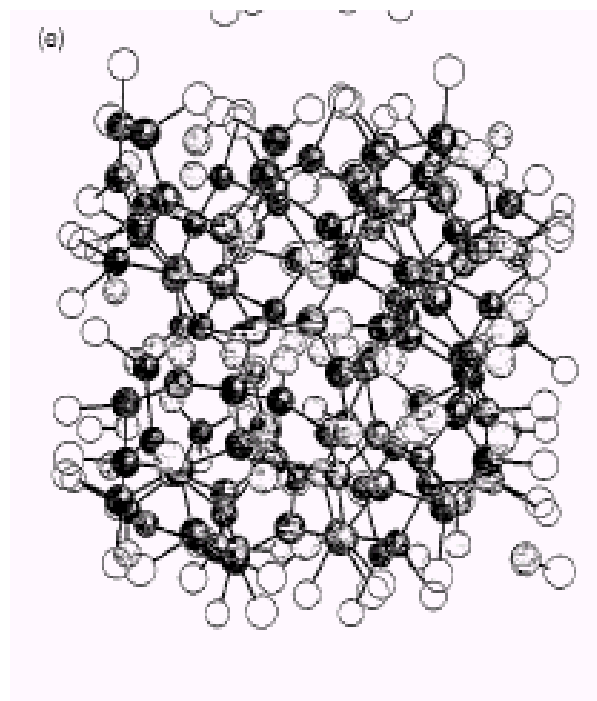
Marcelo Evers, Juan Lucas Nachez,
Dante Franceschini

DLC – Diamond-like carbon

DLC

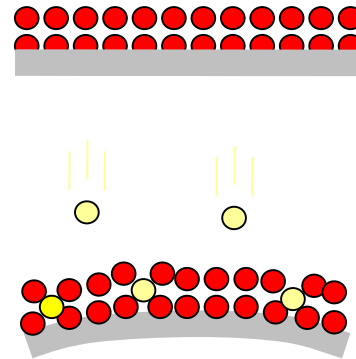
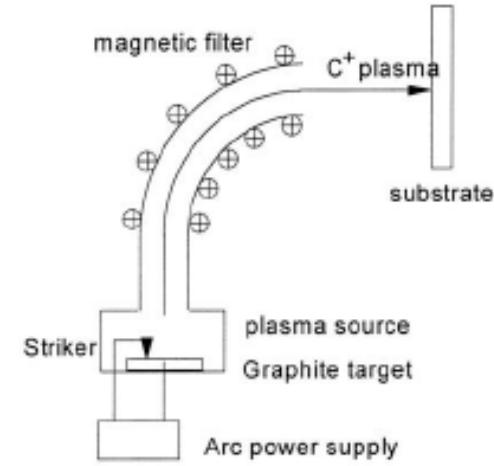
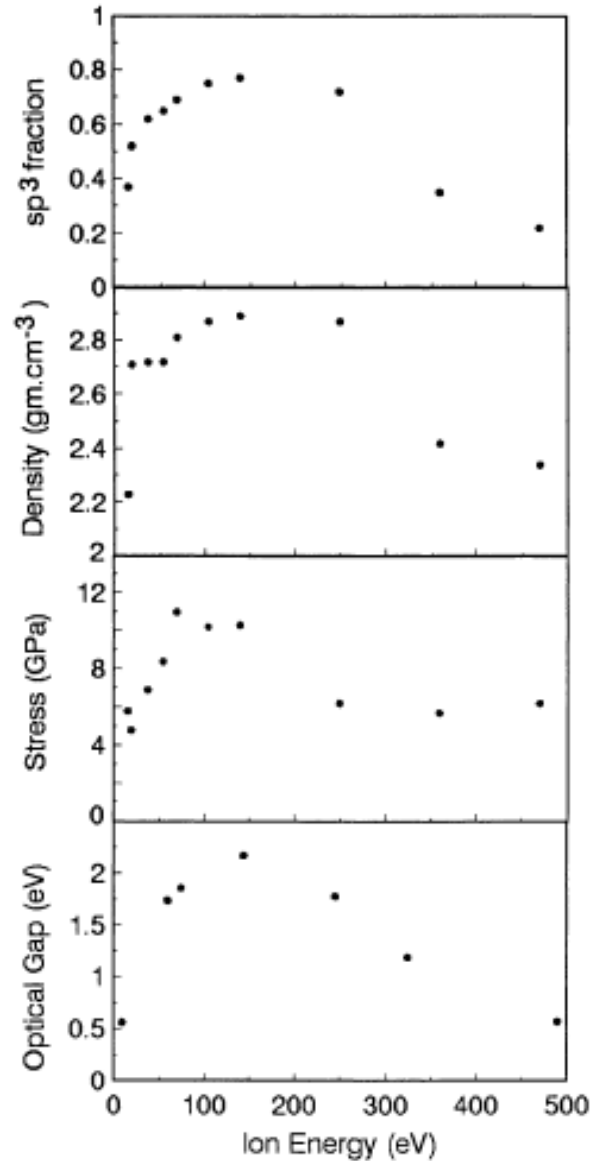
sp^3 (%)	sp^3 (%)	H (% at.)	Densidade (g / cm ³)	Gap (eV)	Dureza (GPa)
Diamante	100	0	3.515	5.5	100
Grafite	0	0	2.267	0	
ta-C	80-88	0	3.1	2.5	80
a-C:H duro	40	30-40	1.6-2.2	1.1-1.7	10-20
a-C:H macio	60	40-50	1.2-1.6	1.7-4	<10
ta-C:H	70	30	2.4	2-2.5	50
polietileno	100	67	0.92	6	0.01

Modelo de Aglomerados



Aglomerados de C sp^2
(ligações π)

Deposição de ta-C por arco a vácuo

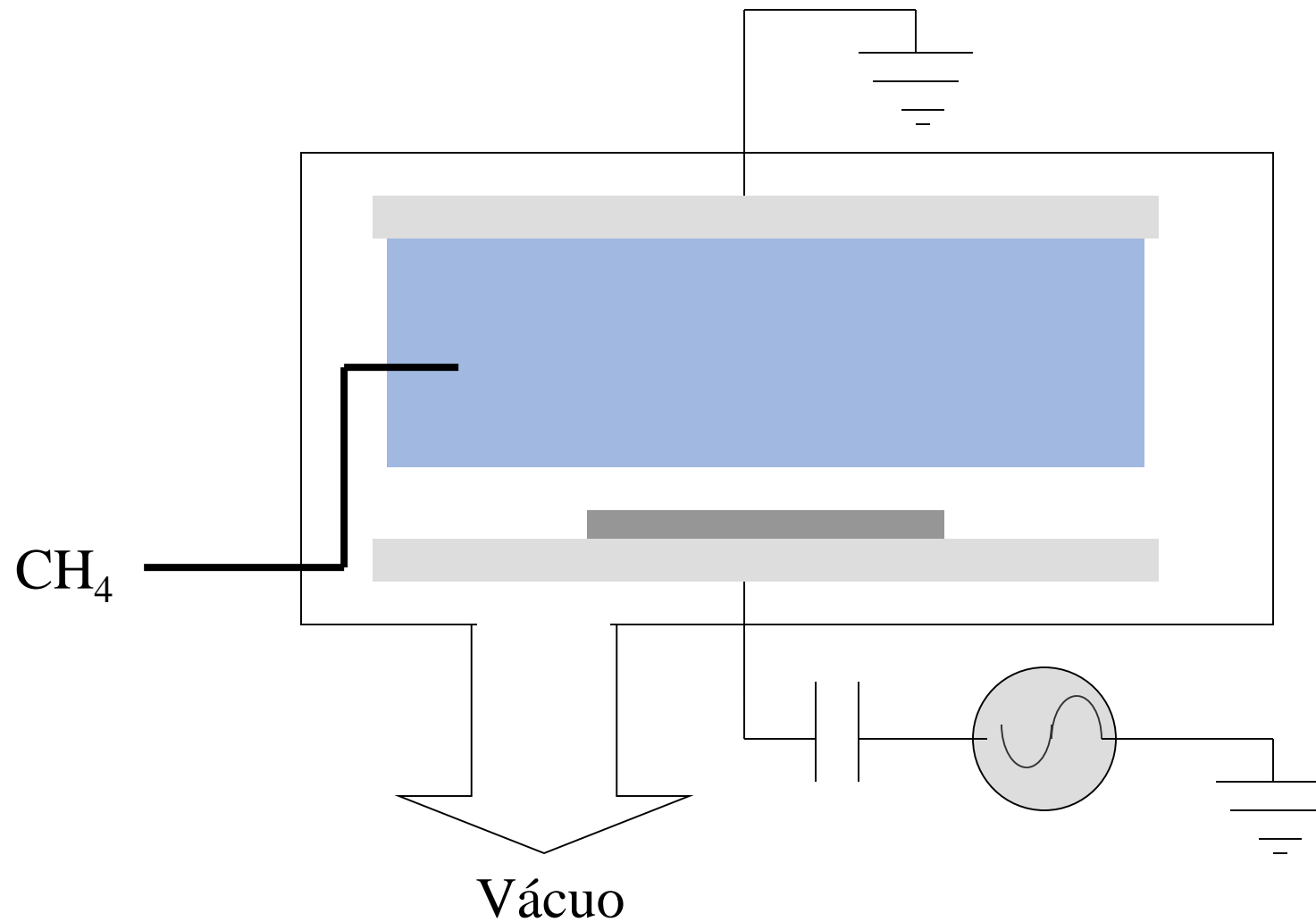


Bombardeamento por partículas com Energia Cinética da ordem de 100 eV

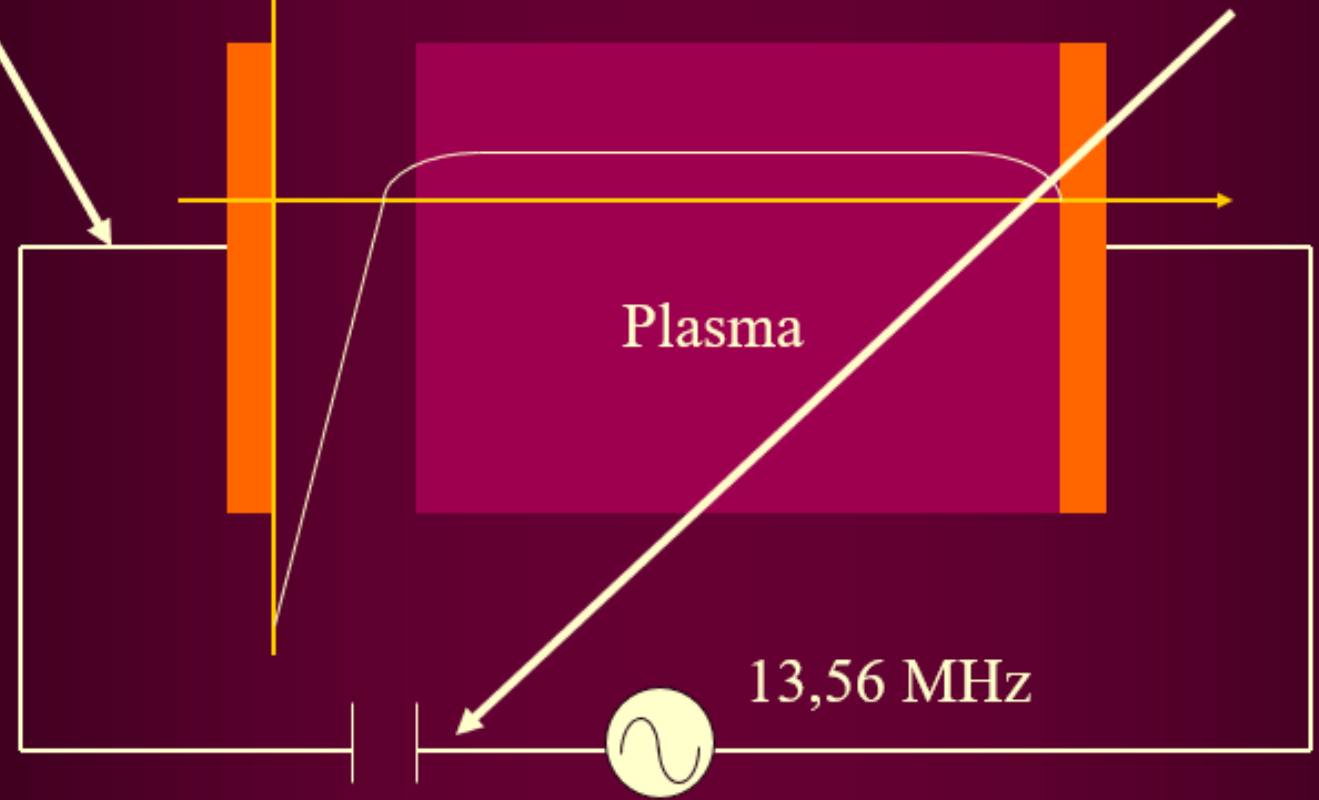
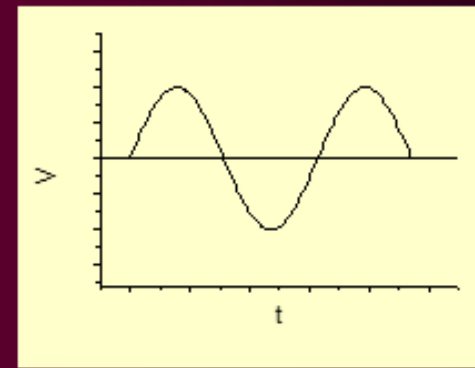
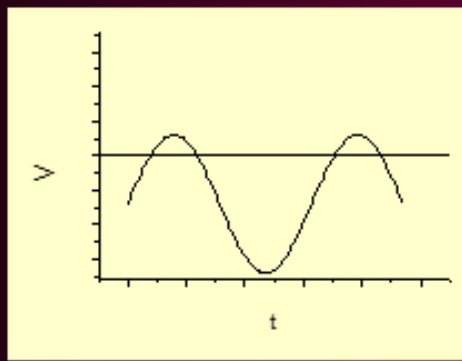


P.J. Fallon et al – Phys. Rev. B 78 (1993) 4777

Deposição por plasma



Descarga rf





Available online at www.sciencedirect.com

SciVerse ScienceDirect

Acta Materialia 60 (2012) 7216–7225



www.elsevier.com/locate/actamat

Flexible diamond-like carbon films on rubber: Friction and the effect of viscoelastic deformation of rubber substrates

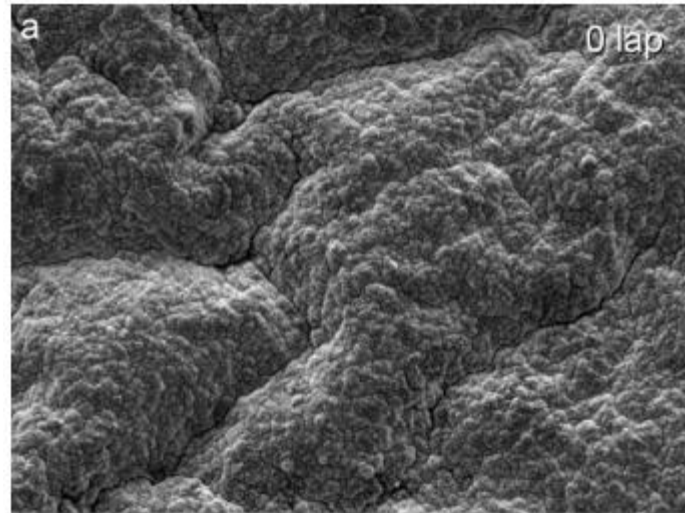
Y.T. Pei^{a,*}, D. Martinez-Martinez^a, J.P. van der Pal^a, X.L. Bui^a, X.B. Zhou^b,
J.Th.M. De Hosson^a

^a Materials Innovation Institute M2i, Department of Applied Physics, University of Groningen, Nijenborgh 4, 9747 AG Groningen, The Netherlands

^b SKF Engineering and Research Center, Kelvinbaan 16, 3439 MT Nieuwegein, The Netherlands

Received 23 March 2012; received in revised form 6 September 2012; accepted 8 September 2012

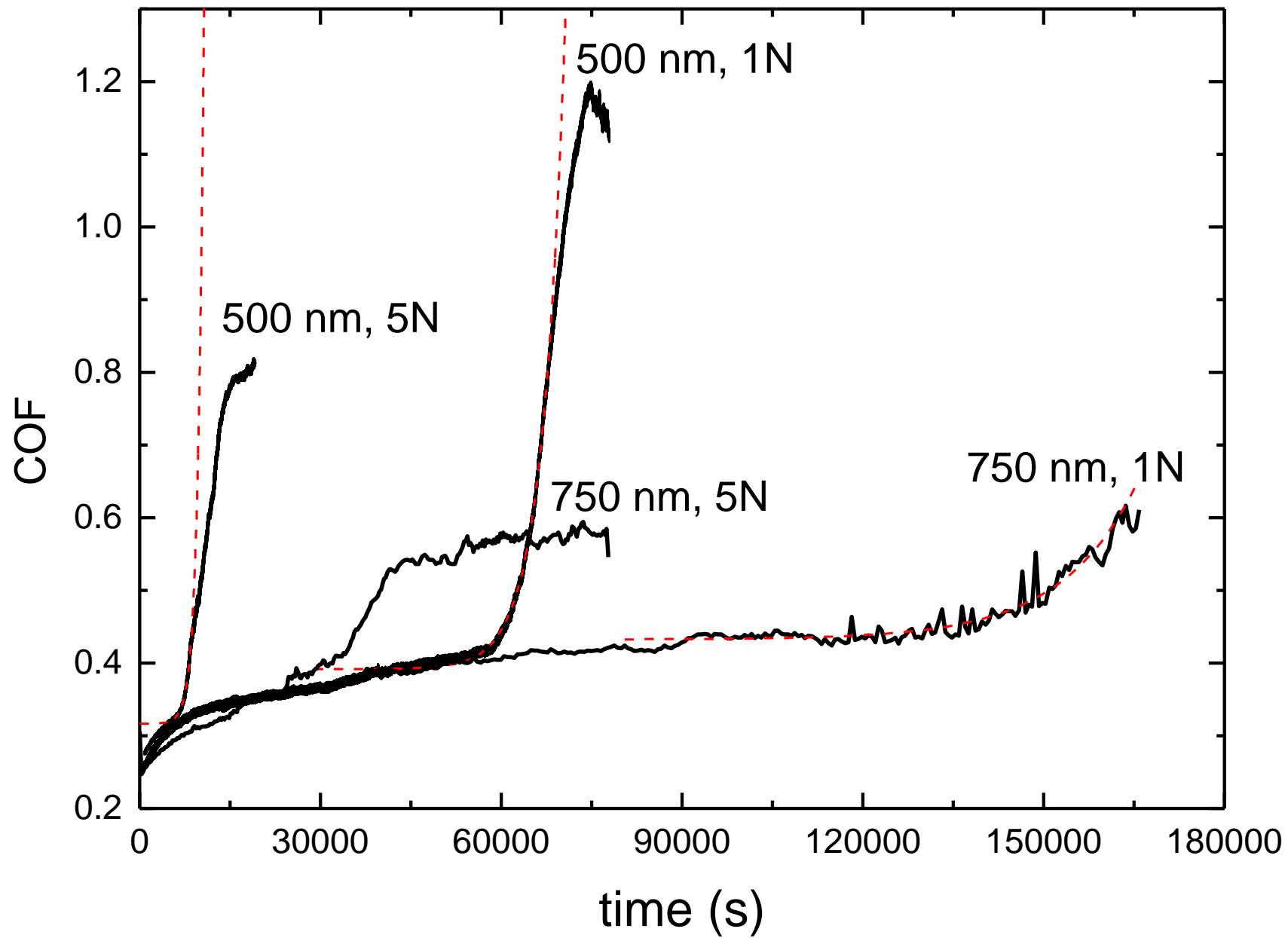
Available online 12 October 2012

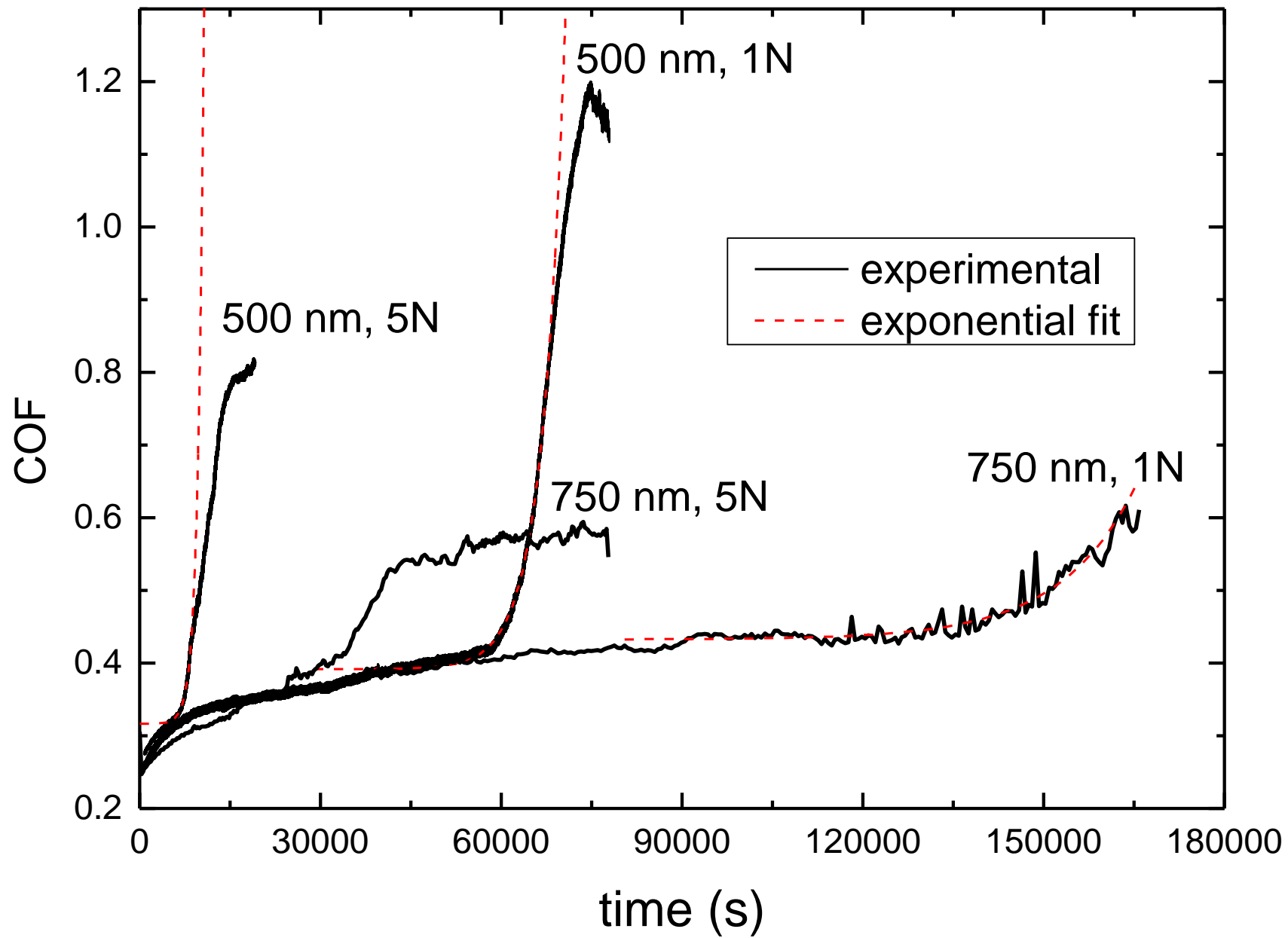


5 μ m

Testes em tribômetro CETR

- DLC depositado com RF-PECVD em CH_4 , 50 mTorr, -300 V, espessura projetada de 500 nm e 750 nm
- Esfera de aço 302, 6 mm ϕ
- $v = 10 \text{ mm/s}$
- $L = 10 \text{ mm}$
- $F = 1\text{N}$ e 5 N
- linear





$$\mu = \mu_0 e^{\alpha t}$$

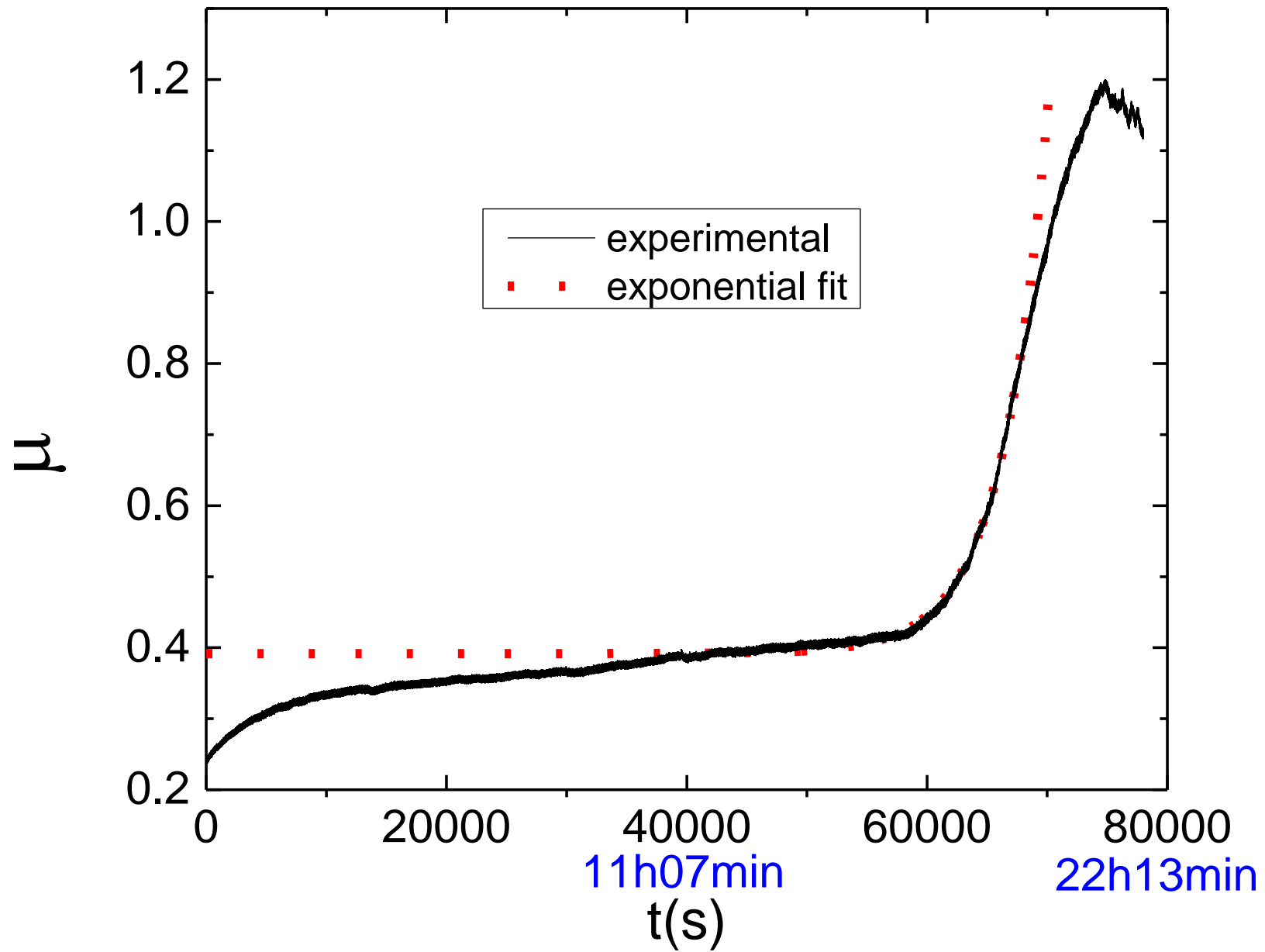
$$d\mu/dt = \alpha\mu$$

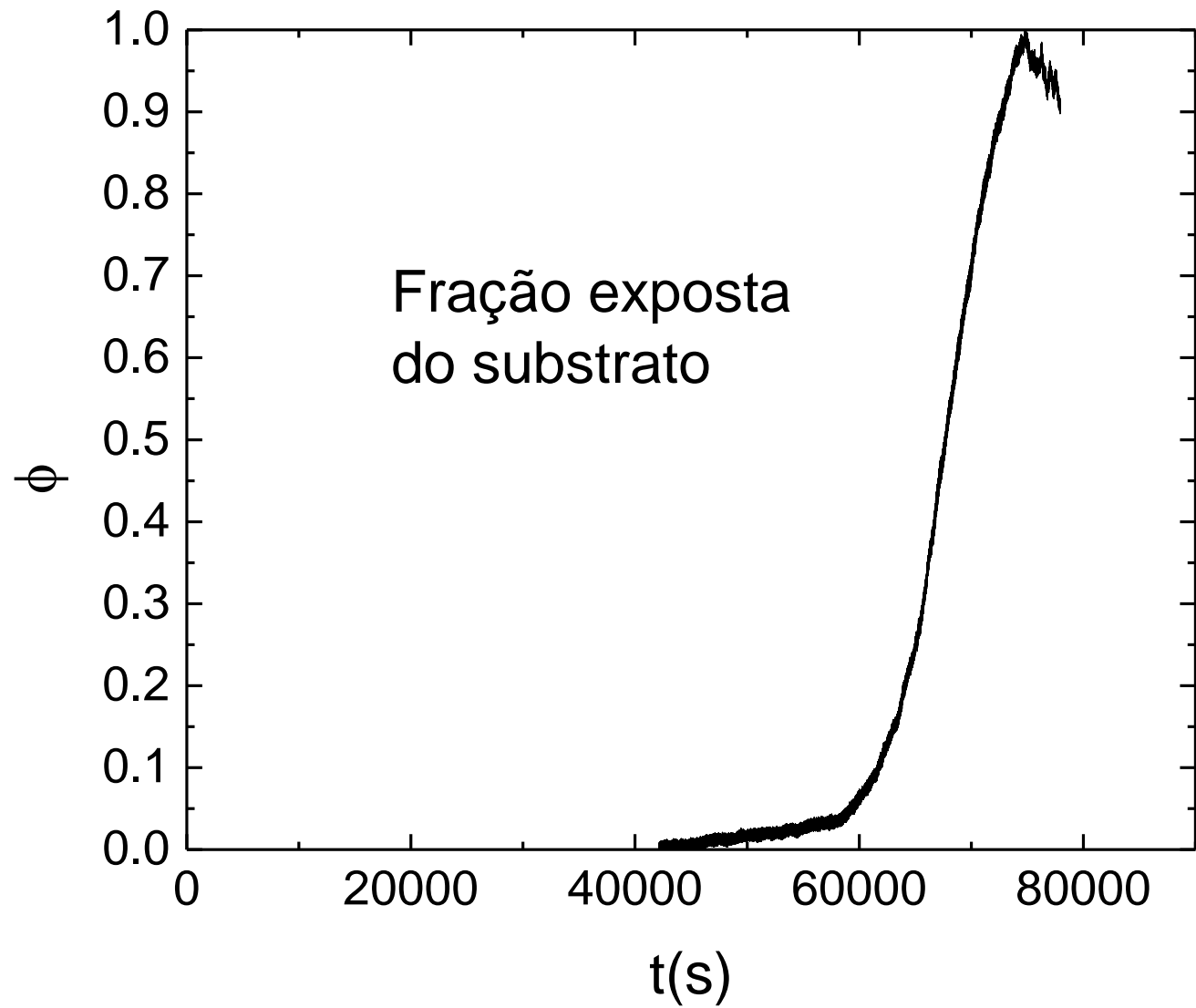
θ = fração exposta do substrato

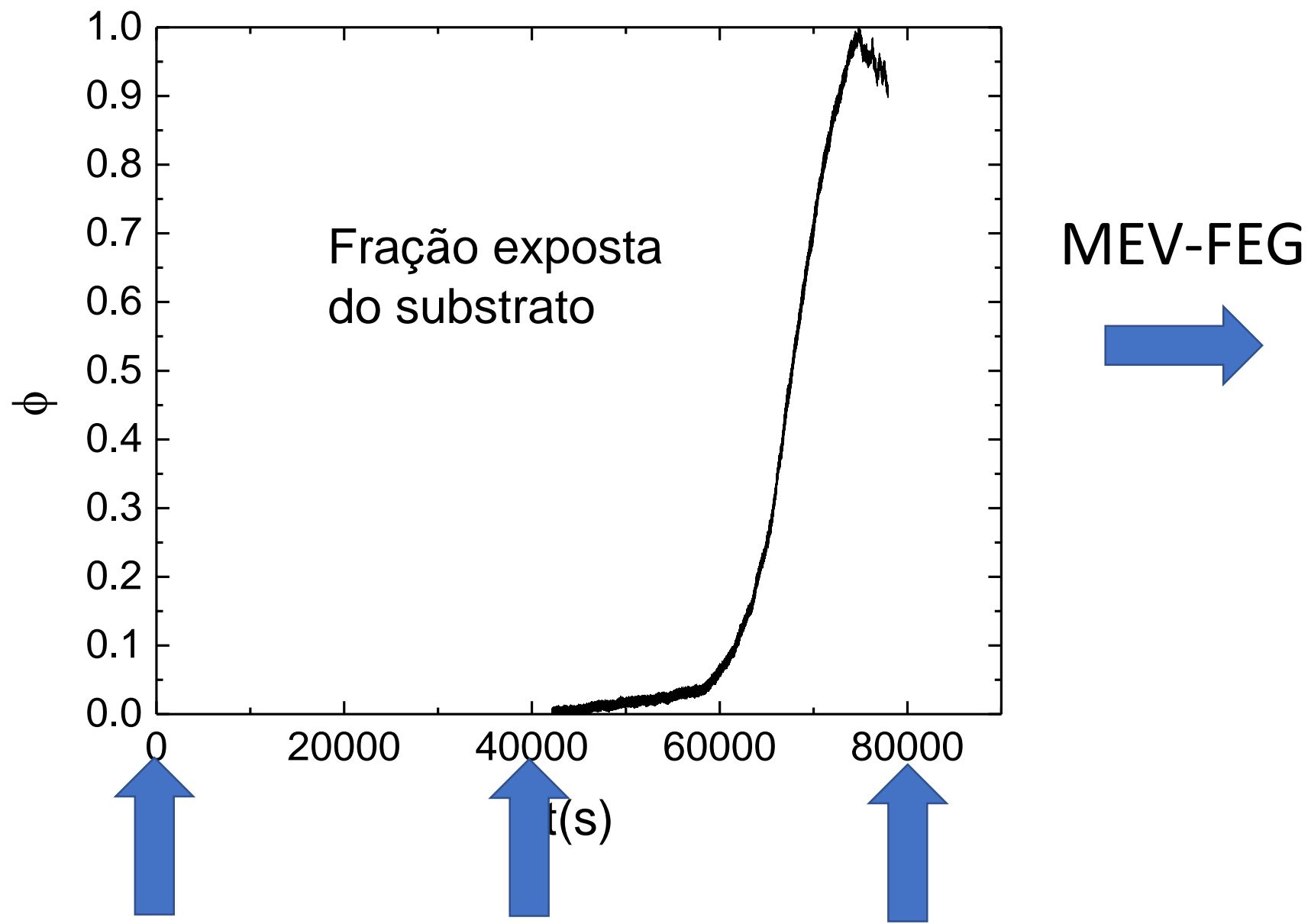
$$\mu = \theta \mu_S + (1-\theta) \mu_F$$

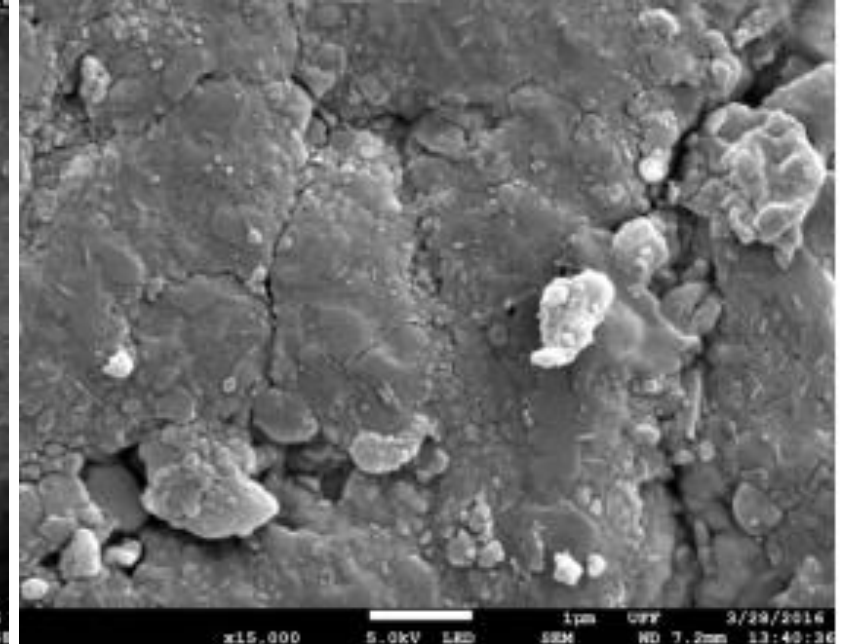
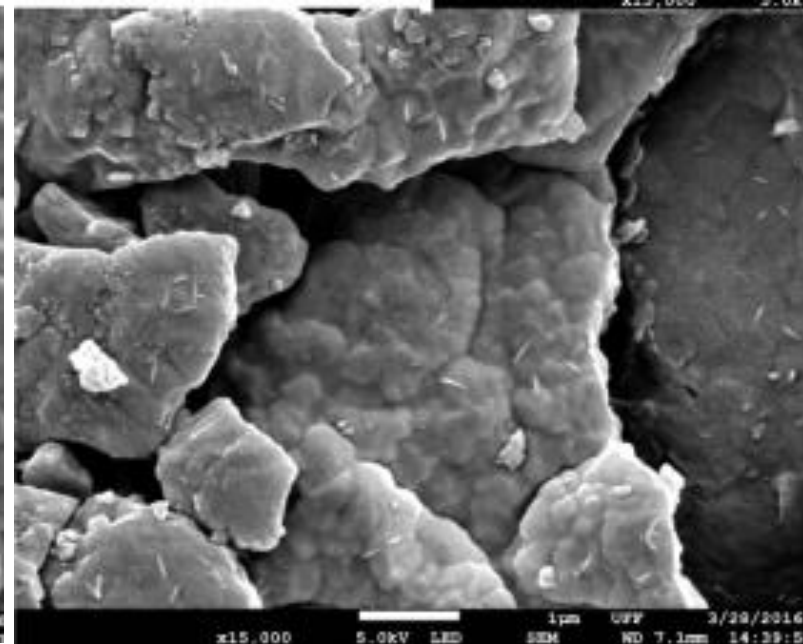
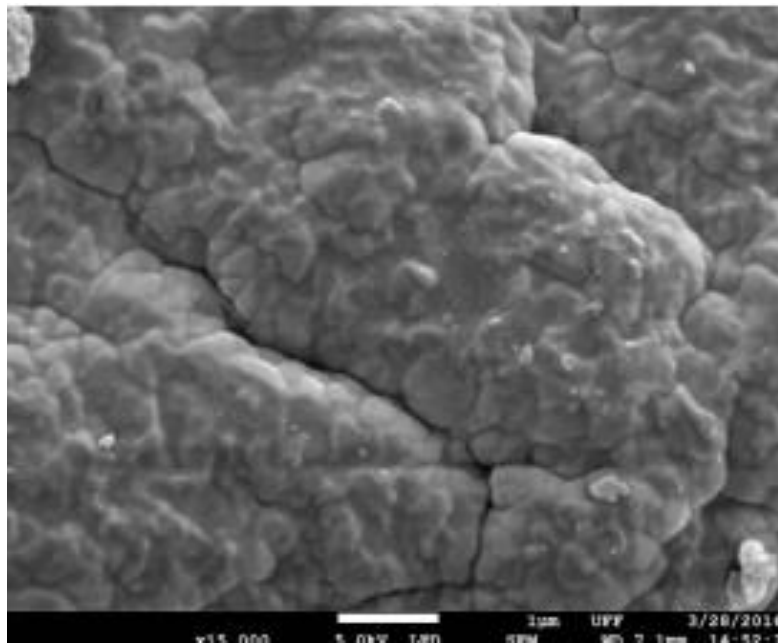
$$\mu = \theta (\mu_S - \mu_F) + \mu_F$$

$$\theta = (\mu - \mu_F) / (\mu_S - \mu_F)$$









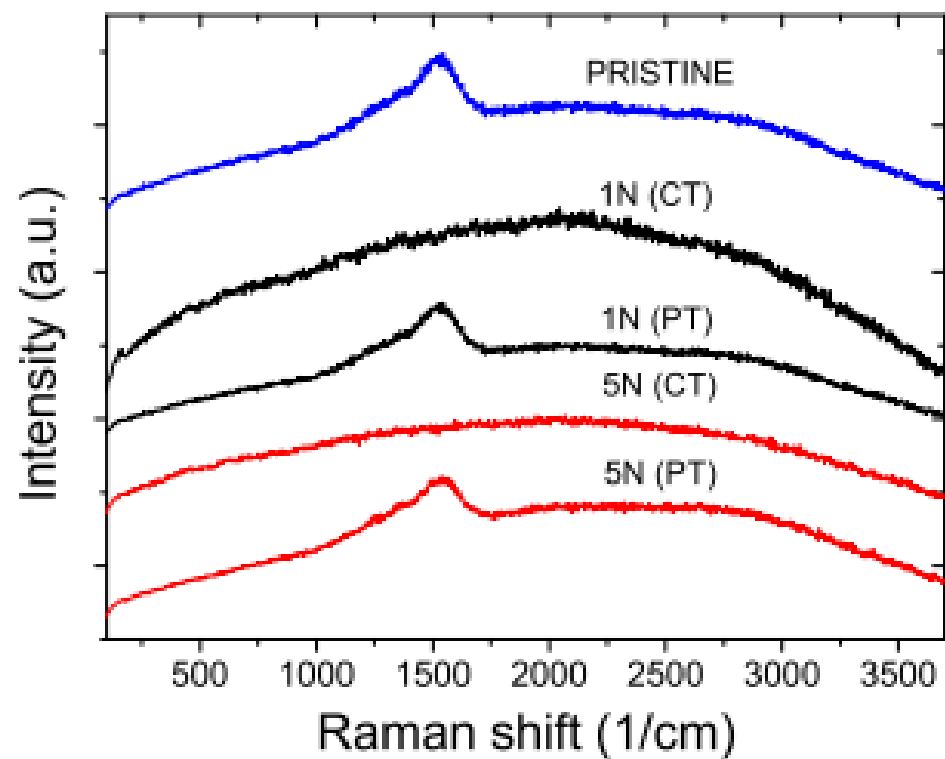


Figure 6: Raman Spectra of selected points in different wear tracks for the 500 nm thickness film.

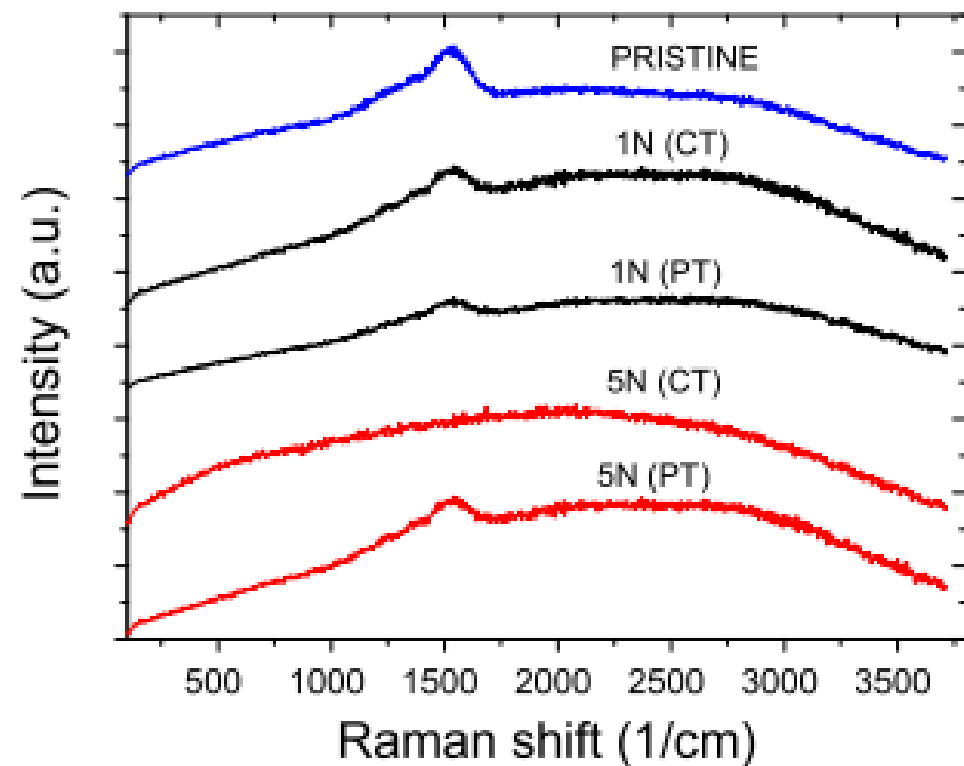


Figure 7: Raman Spectra of selected points in different wear tracks for the 500 nm thickness film.

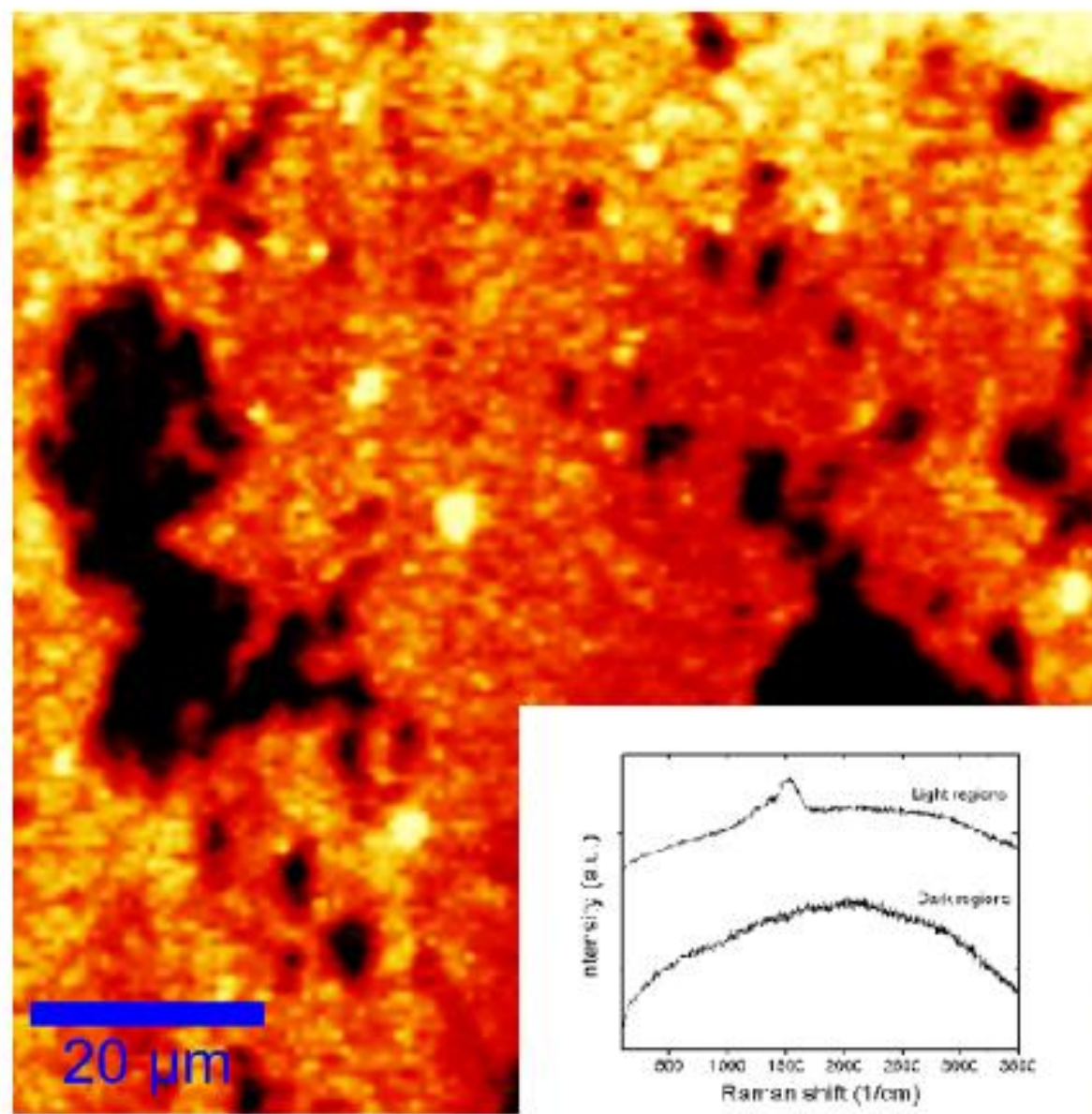
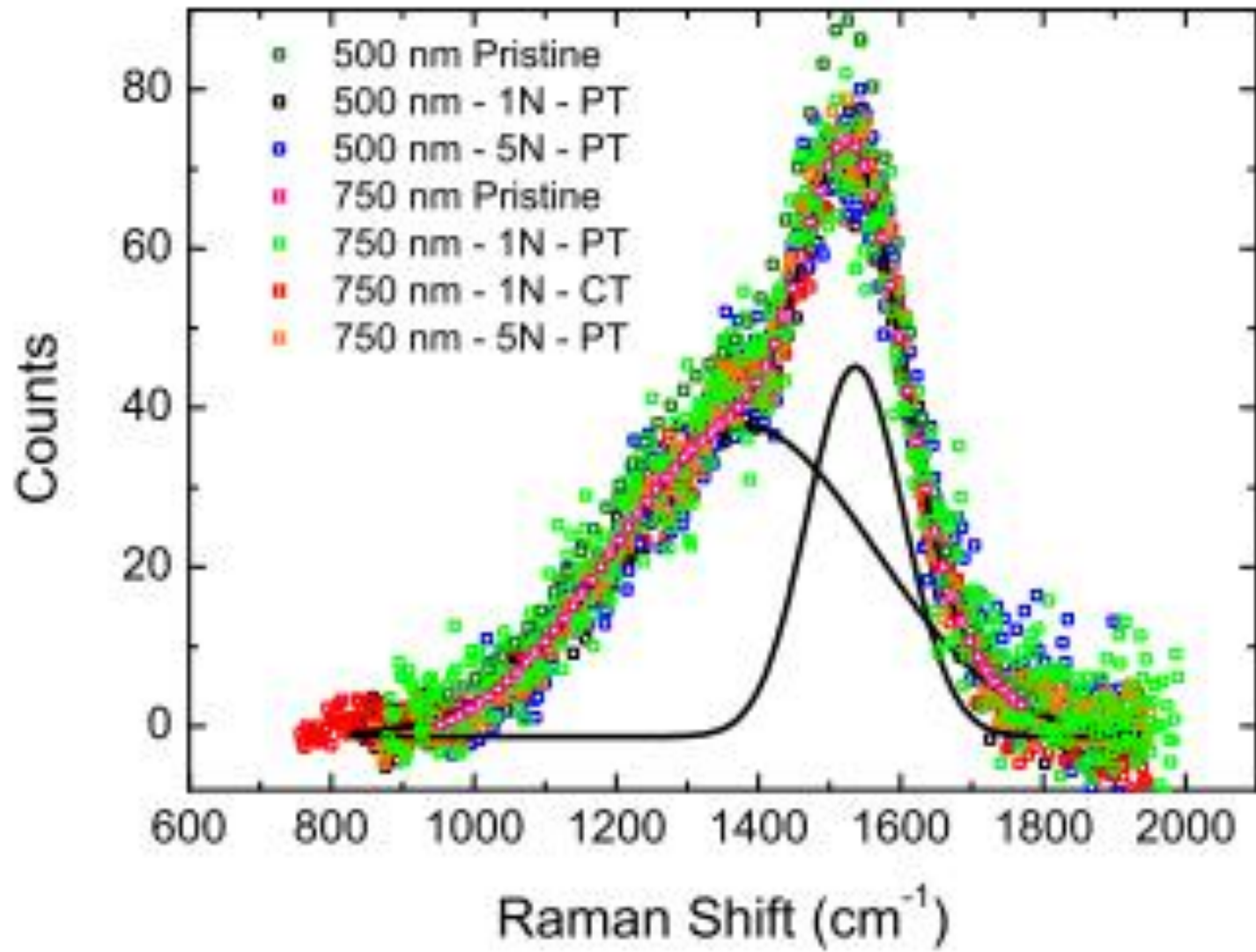
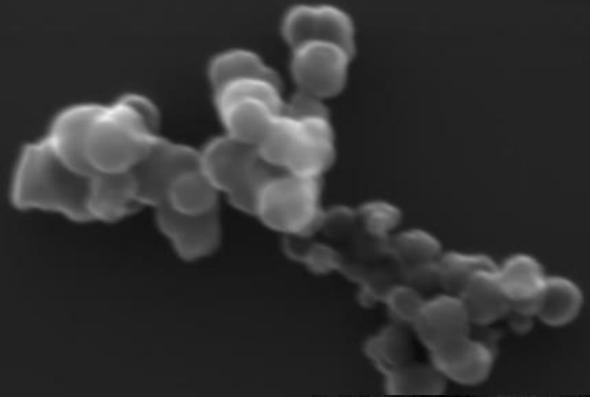
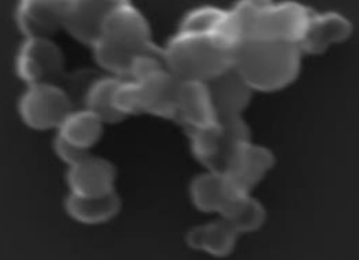


Figure 8: Raman image map for partial track experiment, 1N, 500 nm.







MUITO OBRIGADO!

