

Research Lab Sheet

Lab Name	Plasma Applications
Academic Year	2021-2022

Basic Information	
Department	Physics
Location	Second Floor
Total area (m²)	100 m²
Head of the Lab	Prof. Fayez M. El-Hossary
Establishment Year	1998

Lab Members				
No. of Prof.	No. of Ass. Prof.	No. of Lect.	No. of Ass. Lect. & Demonstr.	No. of technicians
5	--	3	4	2



كلية العلوم
Faculty of Science

حاصلة على شهادة الاعتماد من الهيئة القومية
لضمان جودة التعليم والاعتماد في 2012/7/12م



جامعة سوهاج
University of Sohag

Staff members

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Ass. Lecturers & Demonstrators

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4	Ayman Ahmed	Demonstrator	ayman2019123@gmail.com		

Theses produced by the Lab

M Sc Thesis		
#	Title	Approval date
1	Heat Treatments and Corrosion Resistance tests for austenite stainless steel (304) Samples Using High Frequency Voltage Plasma	1991
2	Studies of some properties of nitrogen-treated stainless steel using the high-frequency plasma method	1992
3	Effect of rf Plasma Carbonitriding on Physical Properties of 304 Stainless Steel and 1050 Aluminum	2001
4	Some physical properties of TiN prepared using Rf plasma	2003
5	Duplex treatment of austenitic stainless steel using plasma	2007
6	Surface treatment of some iron alloys using radio frequency plasma	2007
7	Effect of temperature gradient on the plasma nitriding process of 304 austenitic stainless steel	2009
8	Ti Surface Treatment and Deposition of TiAlN using Plasma Techniques	2013
9	Effect of RF Plasma Treatment on the Mechanical Properties and Biocompatibility of AISI 321, 316 Austenitic Stainless Steels	2015
10	Synthesize and characterization of polymer based nanocomposite solar cells	2018
11	Optical and Electrical Properties of Metal Oxide/Metal/Metal Oxide Multilayers Prepared by Pulsed Magnetron Sputtering.	2021
12	Synthesis and characterization of ZnO nanostructures using RF plasma technique	2021
Ph.D. Thesis		
1	Surface Treatment of Stainless Steel Using Plasma and Ion Based Techniques	2005
2	Surface Treatment of Ti and Ti-6Al-4V Alloy using Plasma and CO2 Laser Techniques	2008
3	Structural and Optical Properties of rf Plasma Carbonitride and Electron Beam Evaporated Indium Tin Oxide Thin Films	2010
4	Biocompatibility and surface properties of nitriding Titanium nickel shape memory alloys by using radio frequency plasma.	2011

5	Surface Properties of Ti Treated Using rf Plasma	2014
6	Preparation some of Ti-based coatings using Plasma pulsed magnetron sputtering for Tribo-Mechanical and Biomedical Applications	2018

Articles produced by the Lab	
#	Title
1	F. M. El-Hossary, A. M. Abd El-Rahman, M. Raaif, Shuxin Qu, Junsheng Zhao, Manfred F. Maitz, M. Abo EL - Kassem "Effect of DC-pulsed magnetron sputtering power on structural,tribological and biocompatibility of Ti–Zr–N thin film" Applied Physics A 124 (1), 1-12
2	A. M. Abd El-Rahman, Moataz H. Ata, F. M. El-Hossary, and R. Wei, "Annealing Effect on Mechanical and Tribological Performance of (Ti/Si)CN Nanocomposite Coatings", 1 st International Conference on Physics, Materials Sciences, Engineering (ICPMSE), 23-25 March 2017, Luxor, Egypt.
3	F. M. El-Hossary, A. M. Abd El-Rahman, Moataz H. Ata, and Amr A. Mohamed, "Nanostructure TiO2 Coatings Prepared by Pulsed Magnetron Sputtering at Different Applied Frequencies", 1 st International Conference on Physics, Materials Sciences, Engineering (ICPMSE), 23-25 March 2017, Luxor, Egypt.
4	F. M. El-Hossary, A. M. Abd El-Rahman, Moataz H. Ata, and M. A. Hassan, "Properties of Nanosontructured Ti-Zr-N Thin Films Prepared by Pulsed Magnetron Sputtering: Applied Power Effect", 11 th International Conference on Mechanical, Manufacturing and Materials Engineering (ICM3E-17), pp. 103-109, 13-15 March 2017, Dubai (UAE).
5	F. M. El-Hossary, A. M. Abd El-Rahman, Moataz H. Ata, and Amr A. Mohamed, "Synthesis of Nanostructure TiO2 Films Using Different Applied Powers of Pulsed Magnetron Sputtering", 11 th International Conference on Mechanical, Manufacturing and Materials Engineering (ICM3E-17), pp. 97-102, 13-15 March 2017, Dubai (UAE)
6	F. M. El-Hossary ¹ , S.U. El-kameesy ³ , M.M. Eissa ² , Al-Zahraa A. Abd Elmula ¹ , Aly Saeed ⁴ , Samah .A .Al-Shelkamy "Effect of Plasma Surface Treatment on AISI 316LStainless Steel for In-Core Applications of Nuclear Reactors, has been published in Sohag Journal of Science.
7	Hanan A. Abotaleb, Ehab Maarouf , F. M. El-Hossary, M. Raaif, Mohamed Kelany Conformity and homogeneity indices for head and neck cancer patients using3DCRT, has been published in Sohag Journal of Science.
8	F. M. El-Hossary, A. M. Abd El-Rahman, M. Raaif and M. Abo EL-Kassem Tribo-Mechanical and

	Electrochemical properties of Carbonitrided 316 Austenitic Stainless Steel by rf Plasma for Biomedical Applications.
9	F. M. El-Hossary, A. M. Abd El-Rahman, Moataz H. Ata, and M.A.Hassan "EFFECT OF NITROGEN GAS RATIO ON THE PROPERTIES OF TI-ZR-N COATINGS DEPOSITED BY PULSED MAGNETRON SPUTTERING" Journal of Engineering Sciences Assiut University Faculty of Engineering Vol. 45 No. 2 March 2017 PP. 142 – 155
10	Fayez Mahmoud El-Hossary , Sayed Mohammed Khalil, Magdy Abdel Wahab Kassem , Medhat Abed EL Lateef , Khaled Lotfy' Improvement of Corrosion resistance of NiTi orthopedic materials by inductively radio frequency plasma, International Journal for Applied Science, 2 (2016) 23-36.
11	Fayez Mahamoud El-Hossary , Sayed Mohammed Khalil , Magdy Abdel Wahab Kassem , Medhat Abd EL Lateef, Doha Saber Mohamed, Khaled Lotfy, The Effect of Radio Frequency Plasma Nitriding on Biocompatibility of Nickel-Titanium Shape Memory Alloys, Journal of Basic and Applied Physics 2016, Vol. 5 Iss. 1, PP. 8-20.
12	FM El-Hossary, AMA El-Rahman, M Raaif, DA Ghareeb, "Properties of TiAlN coating deposited by MPIID on TiN substrates" Applied Physics A 122 (3), 1-11 (2016).
13	F. M. El-Hossary, N.Z. Negm, A. M. Abd El-Rahman, M. Raaif and A. A. Abd Elmula, Tribo-Mechanical and Electrochemical Properties Of Plasma Nitriding Titanium, Surface and Coatings Technology 276, (2015) 658-667
14	El-Hossary, F. , Negm, N. , Abd El-Rahman, A. , Raaif, M. and Abd Elmula, A. (2015) Properties of Titanium Oxynitride Prepared by RF Plasma. <i>Advances in Chemical Engineering and Science</i> , 5, 1-14.
15	F. M. El-Hossary, A. M. Abd El-Rahman, M. Raaif, A. A. Seleem, M. Abo EL-Kassem, Effect of rf Plasma Carbonitriding on Biocompatibility and Mechanical Properties of AISI 321 Austenitic Stainless Steel, <i>Advances in Materials Physics and Chemistry</i> , Vol.4 No.2, February 17, 2014.
16	Fayez Mahamoud El-Hossary, Sayed Mohammed Khalil, Magdy Abdel Wahab Kassem, Medhat Abed EL Lateef and Khaled Lotfy, Tribological properties of biomedical NiTi shape memory alloy after Rf plasma nitriding, <i>Journal of Basic and Applied Physics (JBAP)</i> , August 2013.
17	F. M. El-Hossary, N. Z. Negm, A. M. Abd El-Rahman, A. A. Abd El-Moula, Influence of Temperature Gradient on Surface properties of Nitriding AISI 304 Stainless Steel,
18	F.M. El-Hossary, S. M. Khalil, M. Abd Elhamed, Kh. Lotfy, M. A. Kassem, Kh Lotfy Effect of Fe ₉₃ Ni ₄ Ti ₃ microstructure on rf plasma nitriding process,
19	Structural, mechanical and optical properties of nitrogen-implanted titanium at different pulse frequency, M. Raaif, S. H. Mohamed, A. M. Abd El-Rahman ¹ , and A. Kolitsch, <i>Eur. Phys. J. Appl. Phys.</i> (2013) 62: 10802.

20	Plasma oxidation of electron beam evaporated cadmium thin films, H.M.Ali, M. Raaif, Thin Solid Films 520(2012) 4418 -4421.
21	Mechanical and ellipsometry measurements of thin TiN layer prepared by PIII, A.M. Abd El-Rahman, M. Raaif, S.H. Mohamed, A. Kolitsch, Materials Chemistry and Physics 132 (2012) 91– 95
22	Physical properties of thermally evaporated silicon films nitrided at different rf plasma-processing time, S. H. Mohamed, M. Raaif and A. M. Abd El-Rahman, Journal of Materials Science, J Mater Sci (2012) 47:2875–2881
23	S.H. Mohamed , M. Raaif , Effects of thickness and rf plasma oxidizing on structural and optical properties of SiOxNy thin films, 205 (2010) 525–532
24	S. H. Mohamed , M. Raaif , A. M. Abd El-Rahman, Physical properties of thermally evaporated silicon films nitrided at different rf plasma-processing time, (2012) 47:2875–2881 DOI 10.1007/s00339-010-5564-9
25	F.M. El-Hossary · N.Z. Negm · S.M. Khalil A.M. Abed El-Rahman · M. Raaif · S. Mändl , Effect of annealing temperature on hardness, thickness and phase structure of carbonitrided 304 stainless steel, (2010) 99: 489–495 DOI 10.1007/s00339-010-5564-9·
26	A.M. Abd El-Rahmana, M. Raaifa, S.H. Mohameda,b, A. Kolitschc, Mechanical and ellipsometry measurements of thin TiN layer prepared by PIII, 132 (2012) 91– 95
27	N. Z. Negm, F. M. EL-Hossary, and L. M. Watson, XPS and SXES measurements on Cu atoms in Al-Cu alloy, to be published.
28	N. Z. Negm, F. M. EL-Hossary, and L. M. Watson, XPY study of metastable states in Al-Cu (4 wt.%) alloy, to be published.
29	A. M. Abed Elrahman, Effect of rf plasma carbonitriding on tribological and corrosion-resistance properties of AISI 321 stainless steel, <i>Volume 205, Issue 2, 15 October 2010, Pages 674-681.</i>
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31	F. M. El-Hossary, S. M. Khalil, M. Abd Elhamed, M. A. Kassem, Kh Lotfy, Effect of Fe ₉₃ Ni ₄ Ti ₃ microstructure on rf plasma nitriding process ,volume 1,page 151-157,Aug 2010
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33	F. M. El-Hossary, S. M. Khalil, M. Abd Elhamed, M. A. Kassem, Kh Lotfy: The influence of hot-rolled temperature on plasma nitriding behavior of Iron-Based alloys, Journal of Low Temperature Physics,

	Volume 156, Numbers 1-2 / July 2009.
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	hardness of $\text{RuSr}_2\text{GdCu}_2\text{O}_8$, Superconductor Science And Technology 20 (2007) 372-376.
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60	M. A. Eissa, A. M. Nossair, F. F. Elakshare, F. M. El-Hossary, and A. M. El Halafawy, Carbonitriding of ASS by ICRF Discharge, First Cairo Conference on Plasma Physics & Applications, 11-15 October (2003)
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63	F. M. El-Hossary, N. Z. Negm, and S. M. Khalil, A. M. Abed Elrahman, Formation and properties of carbonitrided layers in 304 stainless steel using different Rf plasma powers, Thin Solid films, 405,1-2 (2002) 179-185.
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لضمان جودة التعليم والاعتماد في 2012/7/12م

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Lab instruments						
#	Device	quantity	Quality			
			Good	Poor	Need maintenance	malfunction
1	Rf Plasma	2	√			
2	Dc Pulsed magnetron sputtering	1	√			
3	Dc or Rf magnetron sputtering	1	√			
4	Atmospheric plasma	2	√			
5	Microhardness	1	√			
6	Optical Microscope	1	√			
7	Profilometer	1	√			
8	Corrosion resistance	1	√			
9	Ball –on- disk Tribometer	1	√			
10	Mounting press	1	√			
11	Ultra sonic cleaner	1	√			
12	Polisher machine	1	√			
13	Image Analyzer	1	√			
14	Phoenix 300 (surface energy & contact angle Analyzer)	1	√			
15	Jasco Spectrophotometer	1	√			

Instruments Description

Device image	Description /use
	- Surface treatment. - plasma etching - Enhancement the mechanical properties - Enhancement the corrosion resistance for some alloys. - Enhancement the Biocompatibility for some alloys.
	- Deposition different materials thin film. - Deposition multi layers. - Enhancement mechanical and electrical properties. - Deposition nonconductive materials.

	- surface treatment of Textile
	- surface sterilization - Polymer treatment - Using in different medical applications
	- Image analyzer - calculate film thickness - calculate the phase percentage



كلية العلوم
Faculty of Science

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جامعة سوهاج
University of Sohag



- measurement the surface microhardness



- measurement the corrosion resistance



- measurement the friction coefficient and wear resistance



- measurement the surface roughness parameters

	- measurement the surface energy and contact angle
	- Using for calculate the Optical parameters

Evaluate the fulfillment of lab to appropriateness of areas, building installations, facilities and human resources standards

Areas of assessment		Indicators	Yes	Somewhat	No
Floor area and capacity	1	Adequacy of the total capacity of the lab for the number of researcher (1).			
Windows and doors	2	Availability of windows for adequate ventilations.			

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	3	Ease of use of windows.			
	4	There are two exits (doors) at least (2).			
	5	There are signs to locate directions of emergency exits			
Equipment	6	Appropriate temperature during the lectures (3).			
	7	Availability of good ventilation (4).			
	8	The existence of adequate lighting (4).			
	9	Lab is connected to the Internet			
	10	The existence of directions inside the Lab showing entrances and emergency exits.			
Security and Safety	11	Existence of firefighting equipment near the hall (5).			
	12	Cleanliness of the room.			