

연구실 명

연구실 세부명



성 명 : / 교수
 Email : erfan@hanyang.ac.kr
 Tel : 02-2220-0442
 경력
 · 2001 기계공학 박사
 · 1996 기계공학 석사
 · 1995 기계공학 학사

담당 과목
 · (학부)
 · (대학원)
 연구관심분야
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연구실 명 연구실 전화 02-2220- Homepage http:// .hanyang.ac.kr

연구실 소개	<ul style="list-style-type: none"> ● 보유장비 	
	<ul style="list-style-type: none"> ● 연구실 특징 	
	<ul style="list-style-type: none"> ● 주요 연구 논문 	
	<ul style="list-style-type: none"> ● 주요 특허 	

주요 연구 / 프로젝트	<ul style="list-style-type: none"> ● 	
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연구실 명(영문)

연구실 세부 명(영문)

	<p>Erfan Zal Nezhad / Professor Email erfanzal@hanyang.ac.kr Tel 02-2220-0442</p> <p>Careers</p> <ul style="list-style-type: none">· 2015-Present Assistant Professor. Hanyang University· 2013-2015 Assistant Professor. University of Malaya, Malaysia· 2013 Mech. Eng., Ph.D. University of Malaya, Malaysia· 2007 Mech. Eng., M.S. Islamic Azad University, Iran· 2001 Mech. Eng., B.S. Islamic Azad University, Iran	<p>Subject for Lecturing</p> <ul style="list-style-type: none">· Engineering Mathematics II & III (Undergraduate)· Statics (Undergraduate)· Surface Engineering & Coating Technology (Graduate)· Thesis and Journal Writing in English (Graduate) <p>Research Interests</p> <ul style="list-style-type: none">· Using thin film nanomaterials to enhance tribomechanical properties, corrosion resistance and biocompatibility of implant bio-metallic materials.· Using nanomaterials in the form of nanotubes, nanograins, and nano needles to enhance energy efficiency in polymer and dye-sensitized solar cells.
	<p>Tel 02-2220-0442</p>	<p>Homepage https://sites.google.com/site/surfacenanocoating/</p>

Laboratory

● Equipment

- TOYOTECH TDP-2001B Regulated DC Power Supply
- WiseStir MSH-D Digital Hotplate Stirrer
- WiseClean Digital Ultrasonic Cleaner

● Laboratory

-Thin film nanomaterials such as TiO₂, Ta₂O₅, ZrO₂, and Al₂O₃ are used to enhance tribo-mechanical properties, corrosion resistance and biocompatibility of implant bio-metallic materials. Application of physical vapor deposition along with anodic oxidation are used to fabricate the nanotubeular structures.

-Aforementioned nanomaterials in the form of nanotubes, nanorods, nanograins, and nano needles are used to enhance energy efficiency in polymer and dye-sensitized solar cells. In this regard, nitrogen-doped graphene atop different nanotubes including: titania, zirconia, tantalum pentoxide, alumina and vanadium pentoxide are used to improve charge carrier transport.

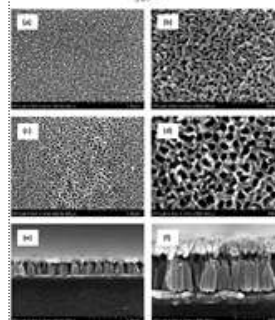
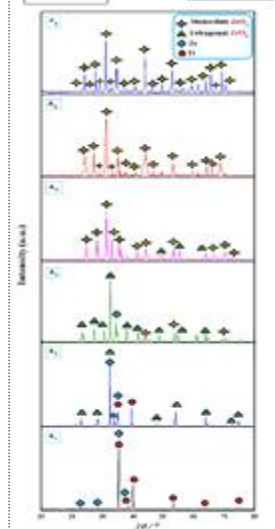
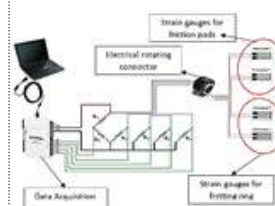
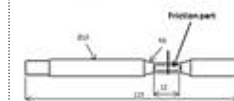
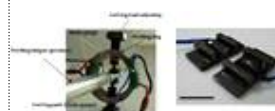
-a list of novel nitrogen-doped graphene/metal chalcogenide composite thin film are synthesized and applied them as economical platinum-free counter electrode catalysts to replace the expensive Pt for the regeneration of the redox couples in DSSCs based on different nanotubes photoanode including: titania, zirconia, tantalum pentoxide, alumina and vanadium pentoxide for improved the electrocatalytic activity of DSSCs.

● Main Research Papers

- Peyman Jahanshahi, Erfan Zalnezhad, Shamala Devi Sekaran, Faisal Rafiq Mahamd Adikan, Biosensor Based on Antigen immobilization for early detection of Dengue Serotypes, Scientific Reports, Nature, DOI:10.1038/srep03851.
- AR Rafieerad, AR Bushroa, E Zalnezhad *, M Sarraf, WJ Basirun, Microstructural development and corrosion behavior of self-organized TiO₂ nanotubes coated on Ti-6Al-7Nb, Ceramics International, doi:10.1016/j.ceramint.2015.05.025.
- Mohsen Marani Barzani, Erfan Zalnezhad,Saeed Farahani, Ahmed A.D. Sarhan, Ramesh Singh, Fuzzy Logic Baised Model for Predicting Surface Roughness of Machined Al-Si-Cu Cast Alloy Using Different Addeditives-Turning, Measurements, DOI: 10.1016/j.measurement.2014.10.003.

● Main Patent

- A new technique for hard anodizing of Al 7075-t6 alloy, patent, PI 2012005131, 2012, (national).
- Rotating bending fretting fatigue machine, patent, reg. Book no. 427262007, (national).
- Ultrasonic bending fatigue test apparatus for metals, patent no. PI 2014700173.



- Zr/ZrO₂ coating for biomedical application
 - Heat treatment at different annealing temperature changes the morphology and structure of nanotubes
 - The fretting fatigue life of coated specimens are improved at annealing temperature 400° C (tetragonal phase).
- From Zirconium Nanograins to Zirconia Nanoneedles
 - Combinations of three simple techniques were utilized to gradually form zirconia nanoneedles from zirconium nanograins.
 - The nanotube structures of the ZrO₂ were retained up to an annealing temperature of 850 ° C. Further increases in annealing temperature to 900 ° C and 950 ° C resulted in a change in the structure and morphology of ZrO₂ nanotubes to nanorods, nanowires and nanoneedles with diameters of 80–110 nm, 70–100 nm and lengths of 40–60 nm, respectively.
- TiO₂ nanotubular arrays for energy application
 - A sharp peak in the optical absorbance spectra are appeared around the band gap energy, 3.49 to 3.42 eV for annealed and non-annealed, respectively.
 - The thermal process induced growth of the grain size, which influence on the density of particles and the index of refraction. Furthermore, the wettability tests' result displays that the contact angle of intact substrate ($\Theta = 74.7^\circ$) was decreased to 31.4° and 17.4° after anodization for amorphous and heat treated (450 ° C) TNTs coated substrate, respectively.
- Ta₂O₅ thin films for energy application
 - Ta₂O₅ thin films deposited at 300 eV ion-beam energy, 60 $\mu\text{A}/\text{cm}^2$ ion-current density, 20 sccm oxygen flow rate and 0.6 nm/sec rate of deposition showed excellent optical, structural and compressive stress.
- Self-organized TiO₂ nanotube layer on Ti-6Al-7Nb
 - After annealing at 600° C for 2h, crystallization of TiO₂ occurred and consequently nanotubular TiO₂ arrays containing anatase and rutile phases were formed.
 - The average length and diameter of nanotubes array ranged from 2.23 to 4.22 μm and 167 to 200nm, respectively. The surface wettability of the products was affected noticeably by the type of acidic electrolytes and subsequent annealing.

