

## Prof. HÜSNÜ EMRAH ÜNALAN

### Personal Information

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### International Researcher IDs

ScholarID: d02BW-IAAAAJ

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Publons / Web Of Science ResearcherID: F-8392-2012

ScopusID: 9334745700

Yoksis Researcher ID: 19843

### Education Information

Doctorate, Rutgers, The State University of New Jersey, Malzeme Bilimi Ve Mühendisliği, United States Of America 2004 - 2006

Undergraduate, Middle East Technical University, Faculty of Engineering, Department of Metallurgical and Materials Engineering, Turkey 1997 - 2002

### Research Areas

Metallurgical and Materials Engineering, Material science and engineering, Nanomaterials, Engineering and Technology

### Academic Titles / Tasks

Professor, Middle East Technical University, Faculty of Engineering, Department of Metallurgical and Materials Engineering, 2018 - Continues

Associate Professor, Middle East Technical University, Faculty of Engineering, Department of Metallurgical and Materials Engineering, 2013 - 2018

Assistant Professor, Middle East Technical University, Faculty of Engineering, Department of Metallurgical and Materials Engineering, 2009 - 2013

Lecturer PhD, Middle East Technical University, Faculty of Engineering, Department of Metallurgical and Materials Engineering, 2008 - 2009

### Academic and Administrative Experience

Deputy Head of Department, Middle East Technical University, Faculty of Engineering, Department of Metallurgical and Materials Engineering, 2015 - 2018

Fakülte Yönetim Kurulu Üyesi, Middle East Technical University, Faculty of Engineering, Department of Metallurgical and Materials Engineering, 2013 - 2018

## Courses

MATERIALS RESEARCH I, Undergraduate, 2019 - 2020, 2018 - 2019

FUNDAMENTALS OF MATERIALS SCIENCE AND ENGINEERING, Undergraduate, 2019 - 2020, 2018 - 2019

RESEARCH METHODS AND ETHICS IN METALLURGICAL AND MATERIALS ENGINEERING, Postgraduate, 2019 - 2020, 2018 - 2019

MATERIALS ENGINEERING DESIGN II, Undergraduate, 2019 - 2020, 2018 - 2019

MATERIALS RESEARCH II, Undergraduate, 2018 - 2019

## Advising Theses

ÜNALAN H. E., Electron-selective contacts for N-type crystalline silicon solar cells: A study on an ultrathin zirconium oxide layer, Postgraduate, L.AKMAL(Student), 2022

ÜNALAN H. E., Silver nanowire based multifunctional fibers and fabrics, Doctorate, D.DOĞANAY(Student), 2022

ÜNALAN H. E., GROWTH AND PREPARATION OF CADMIUM ZINC TELLURIDE(CDZNTE) DETECTOR CRYSTALS FOR X-RAY AND GAMMA RAY RADIATION APPLICATIONS, Doctorate, M.ÜNAL(Student), 2022

ÜNALAN H. E., Ion implanted homojunction crystalline silicon solar cells, Doctorate, G.BEKTAŞ(Student), 2022

ÜNALAN H. E., Optimization and characterization of polysilicon fabricated by e-beam evaporation for passivating contact silicon (topcon) solar cells, Doctorate, S.HABİBPUR(Student), 2022

ÜNALAN H. E., Optimization of emitter layer in N-type bifacial crystalline solar cell, Postgraduate, Y.SALİMİ(Student), 2022

ÜNALAN H. E., Development of nanocomposite electrodes and separators for supercapacitors, Doctorate, A.AYDINLI(Student), 2022

ÜNALAN H. E., SILVER-PLATINUM CORE-SHELL NANOWIRES FOR ELECTROCHEMICAL APPLICATIONS, Postgraduate, Ş.TUNCA(Student), 2021

Toppare L. K., Ünalán H. E., Silver nanowire inks for fabrics, Postgraduate, M.NUR(Student), 2019

Çırpan A., Ünalán H. E., Properties and application of graphene oxide in inverted bulk heterojunction solar cells, Doctorate, Ş.ÖZCAN(Student), 2019

Ünalán H. E., Silver nanowire/chitosan nanocomposite dry electrodes for electrocardiogram, Postgraduate, S.KAZIM(Student), 2019

ÜNALAN H. E., İMAMOĞLU İ., Investigation of Desalination Performance of Capacitive Deionization Technology, Postgraduate, S.ÖZKUL(Student), 2019

Ünalán H. E., Silver nanowire networks on polydimethylsiloxane for organic and perovskite solar cell electrodes, Postgraduate, E.ÖZLEM(Student), 2019

Ünalán H. E., ÇINAR AYGÜN S., Structural and optoelectronic properties of vanadium pentoxide thin films deposited by ultrasonic spray pyrolysis., Postgraduate, Ş.KOÇ(Student), 2019

Ünalán H. E., Optimization of fabrication steps for n-type c-Si solar cells, Postgraduate, E.ORHAN(Student), 2019

Bayramoğlu T. H., Ünalán H. E., Silver nanowire-decorated glass fiber filters for bacteria removal from water, Postgraduate, E.BAHÇELİOĞLU(Student), 2019

Ünalán H. E., ÇINAR AYGÜN S., Solution-based synthesis of silver-platinum core-shell nanowires with enhanced stability, Postgraduate, S.KOYLAN(Student), 2019

DERİCİOĞLU A. F., ÜNALAN H. E., Functional silver nanowires, Postgraduate, E.ALPUĞAN(Student), 2018

ÜNALAN H. E., Transparent and conducting copper nanowire networks with improved oxidation stability, Postgraduate, S.POLAT(Student), 2018

ÜNALAN H. E., KAYNAK C., Antimicrobial properties of 3d printed silver nanowire/poly lactide nanocomposites, Postgraduate, İ.BAYRAKTAR(Student), 2018

ÜNALAN H. E., Applications of silver nanowire networks in opto-electronic devices, Doctorate, Ş.COŞKUN(Student), 2018

İMER M. B., ÜNALAN H. E., Copper nanowire network based transparent thin film heaters, Postgraduate, D.TİGAN(Student), 2018

ÜNALAN H. E., Modification of single walled carbon nanotube thin films for supercapacitor electrodes, Postgraduate,

M.BATUHAN(Student), 2017

ÜNALAN H. E., DURUCAN C., Structural and optical properties of sol-gel derived nickel oxide thin films, Postgraduate, B.EKİM(Student), 2017

ÜNALAN H. E., Ultrasonic spray coated inorganic thin films for electrochromic applications, Postgraduate, O.TÜREL(Student), 2017

DURUCAN C., ÜNALAN H. E., Structural and optoelectronic properties of sol-gel derived nickel oxide thin films, Postgraduate, B.Ekim(Student), 2017

ÜNALAN H. E., ÇIRPAN A., Development Of Supercapacitors With One Dimensional Nanomaterials, Doctorate, R.Yüksel(Student), 2017

ÜNALAN H. E., TURAN R., Surface texturing study with aluminum induced texturing method on soda-lime glass substrates for thin film solar cells, Postgraduate, M.ÜNAL(Student), 2017

ÜNALAN H. E., BEK A., Production and characterization of multilayered one dimensional plasmonic nanowires, Postgraduate, E.AYGÜN(Student), 2017

ÜNALAN H. E., ÇIRPAN A., Synthesis and Characterization Of Phenanthro Imidazole Based Conjugated Copolymer For Optoelectronic Applications, Postgraduate, N.Sohrabnia(Student), 2016

ÜNALAN H. E., ÇIRPAN A., Syntheses and Optoelectronic Applications Of Thiadiazolo Quinoxaline Bearing Alternating Conjugated Copolymers, Postgraduate, E.Ataoğlu(Student), 2016

ÜNALAN H. E., TURAN R., Fabrication and characterization of carbon nanotube based supercapacitor electrodes, Postgraduate, I.BAKIŞ(Student), 2016

Ünalán H. E., Soyer Y., Detection of antimicrobial effect of silver nanowires embedded in poly lactic acid (PLA) and filter paper on pathogenic bacteria, Postgraduate, C.PERK(Student), 2016

ÜNALAN H. E., KAYNAK C., Production and characterization of polylactide/silver nanowire nanocomposite films, Postgraduate, D.DOĞANAY(Student), 2016

ÇIRPAN A., ÜNALAN H. E., Synthesis and characterization of phenanthro-imidazole based conjugated copolymer for optoelectronic applications, Postgraduate, N.Sohrabnia(Student), 2016

ÜNALAN H. E., ÇIRPAN A., Benzotriazole and Quinoxaline Containing Random Copolymers for Bulk-Heterojunction Polymer Solar Cell Applications, Postgraduate, C.Temiz(Student), 2015

ÜNALAN H. E., Transparent thin film heaters based on silver nanowire networks, Postgraduate, O.ERGÜN(Student), 2015

ÜNALAN H. E., Nanostructure enhanced photovoltaic devices, Doctorate, P.AURANG(Student), 2015

ÜNALAN H. E., ÇIRPAN A., Syntheses and Investigation of Electrochemical Properties of Selenophene and Benzotriazole Bearing Copolymers, Postgraduate, H.Ünay(Student), 2014

ÜNALAN H. E., NALBANT ESENTÜRK E., Growth and characterization of branched gold nanoparticles on surfaces, Postgraduate, N.İLKEM(Student), 2014

ÜNALAN H. E., TURAN R., Growth, characterization and fabrication of AlGa<sub>N</sub>/Ga<sub>N</sub> high electron mobility transistors on silicon carbide substrates, Postgraduate, A.EMEN(Student), 2014

DERİCİOĞLU A. F., ÜNALAN H. E., Investigation of the electromagnetic wave properties of single walled carbon nanotube thin films, Postgraduate, Ş.KÜÇÜKYILDIZ(Student), 2013

DERİCİOĞLU A. F., ÜNALAN H. E., Investigation of the electromagnetic properties of single walled carbon nanotube thin films, Postgraduate, Ş.Küçükyıldız(Student), 2013

ÜNALAN H. E., TURAN R., Silicon nanowires for network photodetectors and plasmonic applications, Postgraduate, E.MÜLAZIMOĞLU(Student), 2013

BEK A., ÜNALAN H. E., A Feasibility study for external control on self-organized production of plasmonic enhancement interfaces for solar cells, Postgraduate, M.Zolfaghari(Student), 2013

ÜNALAN H. E., BEK A., A feasibility study for external control on self-organized production of plasmonic enhancement interfaces for solar cells, Postgraduate, M.ZOLFAGHARI(Student), 2013

ÜNALAN H. E., Synthesis of silver nanowires through polyol process, Postgraduate, Ş.COŞKUN(Student), 2012

ÜNALAN H. E., TURAN R., Optimization of metalization in crystalline silicon solar cells, Postgraduate, O.DEMİRCİOĞLU(Student), 2012

ÜNALAN H. E., TURAN R., Hydrothermal method for doping of zinc oxide nanowires and fabrication of ultraviolet photodetectors, Postgraduate, A.AFAL(Student), 2012

ÜNALAN H. E., TURAN R., Growth and characterization of indium rich indium-gallium-nitride solar cell epitaxial

structures by metal organic chemical vapor deposition, Postgraduate, H.ÇAKMAK(Student), 2012  
ÜNALAN H. E., NALBANT ESENTÜRK E., Synthesis of gold nanowires with high aspect ratio and morphological purity, Postgraduate, E.DERTLİ(Student), 2012  
ÜNALAN H. E., Hydrothermally grown zinc oxide nanowires and their utilization in light emitting diodes and photodetectors, Postgraduate, E.SELEN(Student), 2012  
ÜNALAN H. E., Synthesis of germanium nanowires by vapor transport and fabrication of transparent and flexible photodetectors, Postgraduate, B.AKSOY(Student), 2012  
ÜNALAN H. E., TURAN R., A parametric study on hydrothermal synthesis of zinc oxide nanowires with various zinc salts, Postgraduate, M.CAN(Student), 2012  
ÜNALAN H. E., Synthesis of germanium nanowires by vapor transport and fabrication of fully transparent flexible photodetectors, Postgraduate, B.Aksoy(Student), 2012  
ÜNALAN H. E., TURAN R., Fabrication of silicon nanowires by electroless etching and investigation of their photovoltaic properties, Postgraduate, B.ÖZDEMİR(Student), 2011  
ÜNALAN H. E., TURAN R., Fabrication of silicon nanowires by electroless etching and investigation of their photovoltaic applications, Postgraduate, B.Özdemir(Student), 2011

## Jury Memberships

Award, ODTÜ Prof. Dr. Mustafa N. Parlar Eğitim ve Araştırma Vakfı Ödül Jüri Üyeliği, Orta Doğu Teknik Üniversitesi, December, 2023

Award, ODTÜ Prof. Dr. Mustafa N. Parlar Eğitim ve Araştırma Vakfı Ödül Jüri Üyeliği, Orta Doğu Teknik Üniversitesi, December, 2022

Award, Bilim Akademisi BAGEP 2022 Malzeme Alan Jürisi, Orta Doğu Teknik Üniversitesi, February, 2022

## Published journal articles indexed by SCI, SSCI, and AHCI

- I. **MXene-Deposited Melamine Foam-Based Iontronic Pressure Sensors for Wearable Electronics and Smart Numpads**  
ÇETİN K. Ö., Cicek M. O., Cugunlular M., Bolukbasi T., Khan Y., ÜNALAN H. E.  
Small, vol.20, no.45, 2024 (SCI-Expanded)
- II. **Two-Dimensional TiS<sub>2</sub> Nanosheet- and Conjugated Polymer Nanoparticle-Based Composites for Sensing Applications**  
Yeniterzi D., Cevher S., Kandur Baglicakoglu S., Ucar A., DURUKAN M. B., Hacıfendioglu T., YILDIRIM E., ÇIRPAN A., ÜNALAN H. E., Soylemez S.  
Langmuir, vol.40, no.43, pp.22960-22972, 2024 (SCI-Expanded)
- III. **Post-treatment optimization for silver nanowire networks in transparent droplet-based TENG sensors**  
Cakir O., DOĞANAY D., Cugunlular M., Cicek M. O., DEMİRCİOĞLU O., COŞKUN Ş., ÜNALAN H. E.  
Nano Energy, vol.128, 2024 (SCI-Expanded)
- IV. **Enhanced Nonlinear Optical Limiter in the Visible Spectral Region Based on Fe- and Co-Doped NiO Nanoparticles within PVP Nanofibers**  
PEPE Y., TUTEL Y., AKKOYUN Ş., Asci N., Cevik E., KARATAY A., ÜNALAN H. E., ELMALI A.  
ACS Applied Nano Materials, vol.7, no.14, pp.16007-16017, 2024 (SCI-Expanded)
- V. **Annealing-free, electron-selective ohmic contacts using zirconium oxide and aluminum for n-type crystalline silicon solar cells**  
Madbouly L. A., Nasser H., Borra M. Z., ÇİFTPINAR E. H., Altiner G., Aliefendioglu A., Canar H. H., TURAN R., ÜNALAN H. E.  
Materials Science in Semiconductor Processing, vol.176, 2024 (SCI-Expanded)
- VI. **Lightweight, flexible, and antimicrobial X-ray shielding composites with liquid metal-derived**

### **bismuth-tin core-shell particles**

Dincer O., ŞEYDA D., AKCA G., Cengiz B., Gorur M. C., DOĞANAY D., ÜNALAN H. E., ÇINAR AYGÜN S.  
APPLIED MATERIALS TODAY, vol.38, 2024 (SCI-Expanded)

- VII. **Heat activated VO<sub>2</sub> (R) cathodes for high-performance aqueous zinc ion batteries**  
Aydogdu B., Aydin S., Sasikala S. P., ÜNALAN H. E., Kim S. O., YÜKSEL R.  
Journal of Energy Storage, vol.86, 2024 (SCI-Expanded)
- VIII. **Cutting-edge advancements in MXene-derived materials: Revolutionary electrocatalysts for hydrogen evolution and high-performance energy storage**  
Khan M., Hussain A., Saleh M. T., Ibrahim M., Attique F., Sun X., ÜNALAN H. E., Shafi M., Khan Y., Khan I., et al.  
Coordination Chemistry Reviews, vol.506, 2024 (SCI-Expanded)
- IX. **Visible-light optical limiting of vanadia-polyvinylpyrrolidone nanofibers**  
PEPE Y., TUTEL Y., AKKOYUN Ş., Asci N., Cevik E., KARATAY A., ÜNALAN H. E., ELMALI A.  
Journal of Materials Science, vol.59, no.10, pp.4102-4117, 2024 (SCI-Expanded)
- X. **Self-Charging Dual-Modal Sensor for Glucose Monitoring Based on Piezoelectric Nanowire/Microgel Hybrid Film**  
Kim H., Nam S., DURUKAN M. B., ÜNALAN H. E., Lee H. J.  
ADVANCED FUNCTIONAL MATERIALS, vol.34, no.7, 2024 (SCI-Expanded)
- XI. **An Edible Supercapacitor Based on Zwitterionic Soy Sauce-Based Gel Electrolyte**  
DURUKAN M. B., Keskin D., TUFAN Y., Dincer O., ÇİÇEK M. Ö., YILDIZ B., ÇINAR AYGÜN S., ERCAN B., ÜNALAN H. E.  
ADVANCED FUNCTIONAL MATERIALS, vol.34, no.6, 2024 (SCI-Expanded)
- XII. **Enhanced nonlinear absorption and photoluminescence properties of Zn, Fe, Cu, V and Ni doped MoO<sub>3</sub> transition metal oxide thin films**  
PEPE Y., Tutel Y., Ucar A. D., Cevik E., KARATAY A., ÜNALAN H. E., ELMALI A.  
PHYSICA SCRIPTA, vol.99, no.2, 2024 (SCI-Expanded)
- XIII. **Bismuth-Tin Core-Shell Particles From Liquid Metals: A Novel, Highly Efficient Photothermal Material that Combines Broadband Light Absorption with Effective Light-to-Heat Conversion**  
ŞEYDA D., Dincer O., İnce D., Cugunlular M., ÜNALAN H. E., ÇINAR AYGÜN S.  
Advanced Science, 2024 (SCI-Expanded)
- XIV. **Investigation of the Defect and Intensity-Dependent Optical Limiting Performance of MnO<sub>2</sub> Nanoparticle-Filled Polyvinylpyrrolidone Composite Nanofibers**  
PEPE Y., AKKOYUN Ş., Asci N., Cevik E., TUTEL Y., KARATAY A., ÜNALAN H. E., ELMALI A.  
ACS Omega, vol.8, no.50, pp.47954-47963, 2023 (SCI-Expanded)
- XV. **All-Solution Processed, Highly Stable MXene/Cu Nanowire Networks for Flexible Transparent Thin-Film Heaters**  
ÇETİN K. Ö., Cakir O., Koylan S., DOĞANAY D., Khan Y., ÜNALAN H. E.  
ACS APPLIED NANO MATERIALS, vol.6, no.23, pp.22446-22458, 2023 (SCI-Expanded)
- XVI. **A glucose-responsive microgel-based soft etalon as an epidermal glucose colorimetric sensor**  
Nam S., Kim H., Lee S., DURUKAN M. B., ÜNALAN H. E., Lee H. J.  
Sensors and Actuators B: Chemical, vol.396, 2023 (SCI-Expanded)
- XVII. **Cobalt-doped MoO<sub>3</sub> thin films and dual-band electrochromic devices with excellent cyclic stability**  
Tutel Y., Durukan M. B., Hacıoğlu S. O., Baskose U. C., Toppare L. K., Unalan H. E.  
Applied Materials Today, vol.35, 2023 (SCI-Expanded)
- XVIII. **Wet spun core-shell fibers for wearable triboelectric nanogenerators**  
Doganay D., Demircioglu O., Cugunlular M., Cicek M. O., Cakir O., Kayaci H. U., Aygun S., Ünal H. E.  
Nano Energy, vol.116, 2023 (SCI-Expanded)
- XIX. **Promoting the optical limiting behavior in poly(methyl methacrylate)/α-MnO<sub>2</sub> nanocomposite films through modulation of in-gap states by metal doping**  
Pepe Y., Cevik E., Tutel Y., Karatay A., Unalan H. E., Ayhan E.  
Materials Chemistry and Physics, vol.309, 2023 (SCI-Expanded)
- XX. **3D printing of hexagonal boron nitride nanosheets/poly(lactic acid) nanocomposites for thermal management of electronic devices**

- Gorur M. C., DOĞANAY D., DURUKAN M. B., Cicek M. O., KALAY Y. E., Kincal C., Solak N., ÜNALAN H. E.  
COMPOSITES PART B-ENGINEERING, vol.265, 2023 (SCI-Expanded)
- XXI. **Multifunctional Silk Fibroin/Carbon Nanofiber Scaffolds for In Vitro Cardiomyogenic Differentiation of Induced Pluripotent Stem Cells and Energy Harvesting from Simulated Cardiac Motion**  
Tufan Y., Öztatlı H., Doğanay D., Büyüksungur A., Çiçek M. Ö., Döş I. T., Berberoğlu Ç., Ünal H. E., Garipcan B., Ercan B.  
ACS Applied Materials and Interfaces, vol.15, no.36, pp.42271-42283, 2023 (SCI-Expanded)
- XXII. **Ultra-Sensitive Bio-Polymer Iontronic Sensors for Object Recognition from Tactile Feedback**  
Çiçek M. Ö., Durukan M. B., Yildiz B., Keskin D., Doğanay D., Çinar Aygün S., Çakir M. P., Ünal H. E.  
Advanced Materials Technologies, vol.8, no.16, 2023 (SCI-Expanded)
- XXIII. **MXene-Decorated Nylon Mesh Filters for Improvement of Indoor Air Quality by PM2.5 Filtration**  
Baskoy M. H., Cetin O., Koylan S., Khan Y., Tuncel G., Erguder T. H., Ünal H. E.  
ACS Omega, vol.8, no.26, pp.23465-23476, 2023 (SCI-Expanded)
- XXIV. **Triboelectric nanogenerators for blue energy harvesting in simulated wave conditions**  
DEMİRÇİOĞLU O., ÇİÇEK M. Ö., DOĞANAY D., Gazaloglu G., BAYKAL C., ÇINAR AYGÜN S., ÜNALAN H. E.  
Nano Energy, vol.107, 2023 (SCI-Expanded)
- XXV. **Defect assisted enhanced nonlinear optical performance and optical limiting of pure and doped BiVO<sub>4</sub> powders and nanocomposite films**  
Tekin S., Tutel Y., Karatay A., Ünal H. E., Elmali A.  
Journal of Luminescence, vol.252, 2022 (SCI-Expanded)
- XXVI. **Double-decker lutetium and europium phthalocyanine composites with reduced graphene oxide as supercapacitor electrode materials**  
YABAŞ E., Biçer E., DURUKAN M. B., Keskin D., ÜNALAN H. E.  
Journal of Organometallic Chemistry, vol.980-981, 2022 (SCI-Expanded)
- XXVII. **Direct decoration of carbon nanohorns with binary nickel-cobalt sulfide nanosheets towards non-enzymatic glucose sensing in human fluids**  
Kachouei M. A., Hekmat F., Wang H., Amaratunga G. A., Ünal H. E., Shahrokhian S.  
Electrochimica Acta, vol.428, 2022 (SCI-Expanded)
- XXVIII. **Titanium disulfide decorated hollow carbon spheres towards capacitive deionization**  
Ezzati M., Hekmat F., Shahrokhian S., ÜNALAN H. E.  
Desalination, vol.533, 2022 (SCI-Expanded)
- XXIX. **Silver nanowire loaded poly( $\epsilon$ -caprolactone) nanocomposite fibers as electroactive scaffolds for skeletal muscle regeneration**  
Basturkmen B., Ergene E., Doğanay D., Huri P., Ünal H. E., Aksoy E. A.  
Materials Science and Engineering C, vol.134, 2022 (SCI-Expanded)
- XXX. **Scalable, microwave-assisted decoration of commercial cotton fabrics with binary nickel cobalt sulfides towards textile-based energy storage**  
Hekmat F., Balim U., ÜNALAN H. E.  
Electrochimica Acta, vol.404, 2022 (SCI-Expanded)
- XXXI. **Multifunctional and Physically Transient Supercapacitors, Triboelectric Nanogenerators, and Capacitive Sensors**  
Durukan M. B., Çiçek M. Ö., Doğanay D., Gorur M. C., Cinar S., Ünal H. E.  
ADVANCED FUNCTIONAL MATERIALS, vol.32, no.1, 2022 (SCI-Expanded)
- XXXII. **Nanometer-Thick Mn:NiO and Co:NiO Films for High Performance Nonenzymatic Biosensors**  
TUTEL Y., KOYLAN S., Tunca S., ÜNALAN H. E.  
ACS Applied Nano Materials, vol.4, no.12, pp.13871-13883, 2021 (SCI-Expanded)
- XXXIII. **Fabric based wearable triboelectric nanogenerators for human machine interface**  
DOĞANAY D., ÇİÇEK M. Ö., DURUKAN M. B., Altuntas B., Agbahca E., COŞKUN Ş., ÜNALAN H. E.  
NANO ENERGY, vol.89, 2021 (SCI-Expanded)
- XXXIV. **Thermally Induced Phase Transition and Defect-Assisted Nonlinear Absorption and Optical Limiting in Nanorod Morphology V2O5 Thin Films**

- Pepe Y., Tutel Y., Yildiz E. A., Karatay A., Ünal H. E., Elmalı A.  
ADVANCED ENGINEERING MATERIALS, vol.23, no.10, 2021 (SCI-Expanded)
- XXXV. **Multichromic Vanadium Pentoxide Thin Films Through Ultrasonic Spray Deposition**  
TUTEL Y., DURUKAN M. B., Koc S., KOYLAN S., Cakmak H., Kocak Y., Hekmat F., Ozensoy E., Ozbay E., UDUM Y., et al.  
JOURNAL OF THE ELECTROCHEMICAL SOCIETY, vol.168, no.10, 2021 (SCI-Expanded)
- XXXVI. **Highly stable silver-platinum core-shell nanowires for H<sub>2</sub>O<sub>2</sub> detection**  
Koylan S., Tunca S., Polat G., Durukan M. B., Kim D., Kalay Y. E., Ko S. H., Ünal H. E.  
NANOSCALE, vol.13, no.30, pp.13129-13141, 2021 (SCI-Expanded)
- XXXVII. **Silver-based nanomaterials: A critical review on factors affecting water disinfection performance and silver release**  
Bahcelioglu E., ÜNALAN H. E., Erguder T. H.  
CRITICAL REVIEWS IN ENVIRONMENTAL SCIENCE AND TECHNOLOGY, vol.51, no.20, pp.2389-2423, 2021 (SCI-Expanded)
- XXXVIII. **Microwave-assisted decoration of cotton fabrics with Nickel-Cobalt sulfide as a wearable glucose sensing platform**  
Hekmat F., Ezzati M., Shahrokhian S., ÜNALAN H. E.  
Journal of Electroanalytical Chemistry, vol.890, 2021 (SCI-Expanded)
- XXXIX. **Seamless Monolithic Design for Foam Based, Flexible, Parallel Plate Capacitive Sensors**  
ÇİÇEK M. Ö., DOĞANAY D., DURUKAN M. B., Gorur M. C., ÜNALAN H. E.  
Advanced Materials Technologies, vol.6, no.6, 2021 (SCI-Expanded)
- XL. **Advances in protective layer-coating on metal nanowires with enhanced stability and their applications**  
Bang J., Coşkun Ş., Pyun K. R., Doğanay D., Tunca S., Koylan S., Kim D., Ünal H. E., Ko S. H.  
Applied Materials Today, vol.22, 2021 (SCI-Expanded)
- XLI. **Plasmonic Light-Management Interfaces by Polyol-Synthesized Silver Nanoparticles for Industrial Scale Silicon Solar Cells**  
Birant G., ÖZTÜRK İ. M., DOĞANAY D., ÜNALAN H. E., BEK A.  
ACS Applied Nano Materials, vol.3, no.12, pp.12231-12239, 2020 (SCI-Expanded)
- XLII. **A Point-of-Use (POU) Water Disinfection: Silver Nanowire Decorated Glass Fiber Filters**  
Bahcelioglu E., DOĞANAY D., Coskun S., ÜNALAN H. E., Erguder T. H.  
Journal of Water Process Engineering, vol.38, 2020 (SCI-Expanded)
- XLIII. **Facile preparation of nanoparticle based SERS substrates for trace molecule detection**  
Demirta O., DOĞANAY D., ÖZTÜRK İ. M., ÜNALAN H. E., BEK A.  
PHYSICAL CHEMISTRY CHEMICAL PHYSICS, vol.22, no.37, pp.21139-21146, 2020 (SCI-Expanded)
- XLIV. **All-Solution-Processed, Oxidation-Resistant Copper Nanowire Networks for Optoelectronic Applications with Year-Long Stability**  
Genlik S. P., TİGAN D., Kocak Y., Ercan K. E., ÇİÇEK M. Ö., Tunca S., KOYLAN S., Coskun S., ÖZENSOY E., ÜNALAN H. E.  
ACS APPLIED MATERIALS & INTERFACES, vol.12, no.40, pp.45136-45144, 2020 (SCI-Expanded)
- XLV. **Wearable supercapacitors based on nickel tungstate decorated commercial cotton fabrics**  
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- LXXXV. **Textile Based Ternary Nanocomposite Supercapacitors**  
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## Supported Projects

ÜNALAN H. E., BOYACIGİLLER E., Project Supported by Higher Education Institutions, GÜMÜŞ NANOTEL İLE ÜRETİLEN AKILLI TEKSTİL ÜRÜNLERİNİN DOKUNMATİK ALGILAYICI OLARAK KULLANILMASI, 2018 - 2020

ÜNALAN H. E., YÜKSEL S., Project Supported by Higher Education Institutions, SYNTHESIS OF V2O5 THIN FILMS AND THEIR APPLICATIONS, 2018 - 2020

ÜNALAN H. E., ÖZLEM GÜNER E., Project Supported by Higher Education Institutions, GÜMÜŞ NANOTEL İNCE FİLMERİN YENİLİKÇİ YÖNTEMLERLE ÜRETİLMESİ, 2018 - 2020

ÜNALAN H. E., KOYLAN S., Project Supported by Higher Education Institutions, MİKRODALGA İLE AÇILMIŞ GRAFEN ÜRETİLMESİ VE SÜPERKAPASİTÖRLERDE KULLANILMASI, 2018 - 2020

ÜNALAN H. E., DOĞANAY D., Project Supported by Higher Education Institutions, GÜMÜŞ NANOTEL KAPLAMALI ANTİBAKTERİYEL KUMAŞLARIN GELİŞTİRİLMESİ VE KARAKTERİZASYONU, 2018 - 2020

ÜNALAN H. E., KOÇ Ş., Project Supported by Higher Education Institutions, SYNTHESIS OF VO2 THIN FILMS AND THEIR

THERMOCHROMIC APPLICATIONS, 2018 - 2020

BAYRAMOĞLU T. H., COŞKUN Ş., ÜNALAN H. E., DOĞANAY D., BAHÇELİOĞLU E., Project Supported by Higher Education Institutions, GÜMÜŞ NANOTELLERLE (AgNT) SULARDAN E.COLİ GİDERİMİNİN ARAŞTIRILMASI, 2018 - 2020  
Doğanay D., Ünalhan H. E., Coşkun Ş., TUBITAK Project, Gümüş nanotel Temelli Esnek OLED Elektrotların Geliştirilmesi, 2018 - 2020

ÜNALAN H. E., DURUKAN M. B., Project Supported by Higher Education Institutions, MOLİBDEN DİSÜLFÜR (MoS<sub>2</sub>)/GRAFEN NANOKOMPOZİTLERİNİN ÜRETİMİ VE SÜPERKAPASİTÖRLERDE KULLANIMI, 2018 - 2019

ÇIRPAN A., ÜNALAN H. E., Project Supported by Higher Education Institutions, BENZOTİYADIAZOL VE BENZOTRİAZOL İÇEREN KONJUGE POLİMERLERİN OPTOELEKTRONİK ÖZELLİKLERİNİN İNCELENMESİ, 2018 - 2019

ÜNALAN H. E., Project Supported by Higher Education Institutions, BAKIR NANOTEL ESASLI SAYDAM ISITICI ÜRETİMİ, 2017 - 2017

ÇIRPAN A., ÜNALAN H. E., Project Supported by Higher Education Institutions, ORGANİK GÜNEŞ PİLLERİ VE ORGANİK IŞIK YAYAN DİYOT UYGULAMALARI İÇİN KONJÜGE POLİMERLERİN SENTEZİ, 2017 - 2017

ÜNALAN H. E., COŞKUN Ş., Project Supported by Higher Education Institutions, GÜMÜŞ NANOTEL TEMELLİ ESNEK ŞEFFAF ISITICI ÜRETİMİ, 2017 - 2017

ÜNALAN H. E., POLAT S., ÇIRPAN A., Project Supported by Higher Education Institutions, BAKIR NANOTEL ESASLI ORGANİK GÜNEŞ GÖZELERİ ÜRETİMİ VE KARAKTERİZASYONU, 2017 - 2017

ÜNALAN H. E., Project Supported by Higher Education Institutions, İŞLEVSEL GÜMÜŞ NANOTELLER, 2017 - 2017

ÜNALAN H. E., Project Supported by Higher Education Institutions, VANADYUM OKSİT İNCE FİMLERİNİN ÜRETİMİ, 2017 - 2017

ÜNALAN H. E., Project Supported by Higher Education Institutions, YÜKSEK PERFORMANSLI SÜPERKAPASİTÖRLER İÇİN KARBON NANOTÜP-KOBALT OKSİT NANOKOMPOZİTLERİN GELİŞTİRİLMESİ, 2017 - 2017

ÜNALAN H. E., Project Supported by Higher Education Institutions, GÜMÜŞ NANOTEL KAPLAMALI KUMAŞLARIN GELİŞTİRİLMESİ, 2017 - 2017

ÜNALAN H. E., Project Supported by Higher Education Institutions, MİKRODALGA İLE AÇILMIŞ GRAFEN ÜRETİLMESİ VE SÜPERKAPASİTÖRLEDE KULLANILMASI, 2017 - 2017

ÜNALAN H. E., Project Supported by Higher Education Institutions, HİBRİD NANOPYAPILARIN ELEKTROMANYETİK KALKANLAMA UYGULAMALARI, 2017 - 2017

ÜNALAN H. E., Project Supported by Higher Education Institutions, NANOKOMPOZİTLERİN ÜÇ BOYUTLU YAZICI İLE ÜRETİLMESİ, 2017 - 2017

ÜNALAN H. E., ÖZKUL S., DURUKAN M. B., Project Supported by Higher Education Institutions, KAPASİTİF DEİYONİZASYON PROSESİNİN İYON GİDERME VERİMİNİ ARTTIRMAK AMACI İLE METAL OKSİTLER KULLANILARAK KAPASİTÖRLERİN GELİŞTİRİLMESİ, 2017 - 2017

ÜNALAN H. E., ÇIRPAN A., POLAT GENLİK S., TİGAN D., Project Supported by Higher Education Institutions, Bakır Nanotel Esaslı Şeffaf ve İletken Elektrotların Üretimi ve Karakterizasyonu, 2016 - 2016

ÇIRPAN A., Önk İ., TAŞKAYA ASLAN S., ÜNALAN H. E., CEVHER Ş. C., Project Supported by Higher Education Institutions, Organik Işık Yayan Diyot Uygulamaları İçin Konjüge Polimerlerin Sentezi, 2016 - 2016

ÜNALAN H. E., DERİCİOĞLU A. F., Project Supported by Higher Education Institutions, Takviye Yüzeylerinin Fonksiyonelleştirilmesi ile Mikrodalga Soğurucu Yapısal Kompozitlerin Geliştirilmesi, 2016 - 2016

ÜNALAN H. E., DOĞANAY D., ÇIRPAN A., Project Supported by Higher Education Institutions, 3 BOYUTLU YAZICI YARDIMIYLA GÜMÜŞ NANOTEL KATKILI PLA NANOKOMPOZİT ÜRETİMİ, 2015 - 2016

DURŞUN BALCI D., ÖZKUL S., ÜNALAN H. E., Project Supported by Higher Education Institutions, SUDAN İYONLARIN GİDERİLMESİ İÇİN KAPASİTİF DEİYONİZASYON YÖNTEMİNİN GELİŞTİRİLMESİ, 2015 - 2016

ÜNALAN H. E., Project Supported by Higher Education Institutions, FEN BİLİMLERİ ENSTİTÜSÜ/LİSANSÜSTÜ TEZ PROJESİ, 2014 - 2016

ÜNALAN H. E., Project Supported by Higher Education Institutions, FEN BİLİMLERİ ENSTİTÜSÜ/LİSANSÜSTÜ TEZ PROJESİ, 2014 - 2016

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ÜNALAN H. E., Project Supported by Higher Education Institutions, METAL OKSİT TEMELLİ SÜPERKAPASİTÖRLERİN GELİŞTİRİLMESİ VE KARAKTERİZASYONU, 2015 - 2015

ÇIRPAN A., ÜNALAN H. E., Project Supported by Higher Education Institutions, Benzotriazol ve Benzoditiyofen Tabanlı Donör- Akspetör Tipi Konjüge Polimerlerin Organik Güneş Pili Uygulamaları, 2015 - 2015

ÜNALAN H. E., Project Supported by Higher Education Institutions, FEN BİLİMLERİ ENSTİTÜSÜ/LİSANSÜSTÜ TEZ PROJESİ, 2014 - 2015

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ÜNALAN H. E., Project Supported by Higher Education Institutions, FEN BİLİMLERİ ENSTİTÜSÜ/LİSANSÜSTÜ TEZ PROJESİ, 2014 - 2014

ÜNALAN H. E., Project Supported by Higher Education Institutions, FEN BİLİMLERİ ENSTİTÜSÜ/LİSANSÜSTÜ TEZ PROJESİ, 2014 - 2014

ÜNALAN H. E., Project Supported by Higher Education Institutions, GERİLEBİLİR ELEKTRONİK AYGITLARIN ÜRETİLMESİ ve ÖZELLİKLERİNİN İNCELENMESİ, 2014 - 2014

ÜNALAN H. E., Project Supported by Higher Education Institutions, KARBON TEMELLİ SÜPERKAPASİTÖRLERİN GELİŞTİRİLMESİ VE KARAKTERİZASYONU, 2013 - 2014

ÜNALAN H. E., AURANG P., Project Supported by Higher Education Institutions, NANOYAPILI İNCE FİLM GÜNEŞ GÖZELERİNİN ÜRETİMİ VE KARAKTERİZASYONU, 2013 - 2013

ÜNALAN H. E., AKSOY B., Project Supported by Higher Education Institutions, GERMANYUM NANOTELLERİN ELEKTRONİK CİHAZLARDA KULLANILMASI, 2013 - 2013

ÜNALAN H. E., AFAL A., Project Supported by Higher Education Institutions, BAKIR KATKILI ÇİNKO OKSİT (ZnO) NANOTEL ÜRETİMİ, 2013 - 2013

ÜNALAN H. E., ERGÜN O., Project Supported by Higher Education Institutions, KARBON NANOTÜP ÜRETİMİ, 2013 - 2013

ÜNALAN H. E., YÜKSEL R., Project Supported by Higher Education Institutions, KARBON TEMELLİ SÜPERKAPASİTÖRLERİN GELİŞTİRİLMESİ VE KARAKTERİZASYONU, 2013 - 2013

ÜNALAN H. E., Project Supported by Higher Education Institutions, Germanyum Nanotellerin Üretilmesi Ve Fotodetektörlerde Kullanımının İncelenmesi, 2012 - 2013

ÜNALAN H. E., Project Supported by Higher Education Institutions, Karbon Nanotüp İnce Filmlerin Elektromanyetik Dalga Perdeleme Özelliklerinin İncelenmesi, 2011 - 2012

ÜNALAN H. E., Project Supported by Higher Education Institutions, Silisyum Nanotellerin Üretilmesi Ve Güneş Pillerinde Kullanılması, 2010 - 2010

ÜNALAN H. E., Project Supported by Higher Education Institutions, Çinko Oksit Zno Nanotelleri-I Işık Yayan Diyotların Geliştirilmesi, 2009 - 2010

## Scientific Refereeing

NANO ENERGY, Journal Indexed in SCI-E, December 2023

TUBITAK Project, 1001 - Program for Supporting Scientific and Technological Research Projects, Middle East Technical

University, Turkey, December 2023

JOURNAL OF APPLIED POLYMER SCIENCE, Journal Indexed in SCI-E, November 2023

NANO ENERGY, Journal Indexed in SCI-E, October 2023

NANO ENERGY, Journal Indexed in SCI-E, October 2023

TUBITAK Project, 1005 - National New Ideas and Products Research Support Program, Middle East Technical University, Turkey, October 2023

NANO ENERGY, Journal Indexed in SCI-E, August 2023

ADVANCED MATERIALS TECHNOLOGIES, Journal Indexed in SCI-E, August 2023

TUBITAK Project, 2232 - Dormitory Research Scholarship Program, Middle East Technical University, Turkey, August 2023

JOURNAL OF ENVIRONMENTAL CHEMICAL ENGINEERING, Journal Indexed in SCI-E, July 2023

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NANO ENERGY, Journal Indexed in SCI-E, June 2023

TUBITAK Project, 1001 - Program for Supporting Scientific and Technological Research Projects, Middle East Technical University, Turkey, June 2023

NANO ENERGY, Journal Indexed in SCI-E, May 2023

TUBITAK Project, 3501 - National Young Researcher Career Development Program, Middle East Technical University, Turkey, May 2023

TUBITAK Project, 1001 - Program for Supporting Scientific and Technological Research Projects, Middle East Technical University, Turkey, May 2023

NANOSCALE, Journal Indexed in SCI-E, April 2023

NANO ENERGY, Journal Indexed in SCI-E, March 2023

CHEMICAL ENGINEERING JOURNAL, Journal Indexed in SCI-E, March 2023

TUBITAK Project, 1001 - Program for Supporting Scientific and Technological Research Projects, Middle East Technical University, Turkey, March 2023

TUBITAK Project, 1002 - Quick Support Program, Middle East Technical University, Turkey, February 2023

NANO ENERGY, Journal Indexed in SCI-E, January 2023

ELECTROCHIMICA ACTA, Journal Indexed in SCI-E, November 2022

TUBITAK Project, 2221 - Sabbatical Science Support P., Middle East Technical University, Turkey, November 2022

APPLIED SURFACE SCIENCE, Journal Indexed in SCI-E, October 2022

TUBITAK Project, 3501 - National Young Researcher Career Development Program, Middle East Technical University, Turkey, October 2022

SOLAR ENERGY MATERIALS AND SOLAR CELLS, Journal Indexed in SCI-E, September 2022

Project Supported by Higher Education Institutions, BAP Research Project, Middle East Technical University, Turkey, September 2022

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ACS APPLIED ELECTRONIC MATERIALS, Journal Indexed in SCI-E, August 2022

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TUBITAK Project, 3501 - National Young Researcher Career Development Program, Middle East Technical University, Turkey, August 2022

TÜBA Project, Middle East Technical University, Turkey, August 2022

NANO ENERGY, Journal Indexed in SCI-E, July 2022

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TUBITAK Project, 2232 - Dormitory Research Scholarship Program, Middle East Technical University, Turkey, July 2022

CHEMICAL ENGINEERING JOURNAL, Journal Indexed in SCI-E, June 2022

TUBITAK Project, 1001 - Program for Supporting Scientific and Technological Research Projects, Middle East Technical University, Turkey, June 2022

Project Supported by Higher Education Institutions, BAP Research Project, Middle East Technical University, Turkey, June 2022

TUBITAK Project, 3501 - National Young Researcher Career Development Program, Middle East Technical University, Turkey, June 2022

ADVANCED MATERIALS TECHNOLOGIES, Journal Indexed in SCI-E, April 2022

SMALL, Journal Indexed in SCI-E, March 2022

COMPOSITES PART B: ENGINEERING, Journal Indexed in SCI-E, March 2022

COMPOSITES SCIENCE AND TECHNOLOGY, Journal Indexed in SCI-E, March 2022

NANO RESEARCH, Journal Indexed in SCI-E, February 2022

ACS NANO, Journal Indexed in SCI-E, January 2022

TUBITAK Project, 2232 - Dormitory Research Scholarship Program, Middle East Technical University, Turkey, January 2022

TUBITAK Project, 2232 - Dormitory Research Scholarship Program, Middle East Technical University, Turkey, January 2022

NANO ENERGY, SCI Journal, November 2021

MATERIALS TODAY, SCI Journal, September 2021

NANO LETTERS, SCI Journal, August 2021

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CHEMICAL ENGINEERING JOURNAL, SCI Journal, July 2021

SMALL, SCI Journal, February 2021

JOURNAL OF INDUSTRIAL AND ENGINEERING CHEMISTRY, SCI Journal, February 2021

ACS APPLIED ENERGY MATERIALS, SCI Journal, November 2020

ENERGY STORAGE MATERIALS, SCI Journal, October 2020

SCIENTIFIC REPORTS, SCI Journal, September 2020

CHEMICAL ENGINEERING JOURNAL, SCI Journal, September 2020

JOURNAL OF MATERIALS SCIENCE-MATERIALS IN ELECTRONICS, SCI Journal, June 2020

MATERIALS SCIENCE AND ENGINEERING B-ADVANCED FUNCTIONAL SOLID-STATE MATERIALS, SCI Journal, June 2020

COMPOSITES SCIENCE AND TECHNOLOGY, SCI Journal, May 2020

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MATERIALS TODAY, SCI Journal, May 2020

NATURE COMMUNICATIONS, SCI Journal, May 2020

JOURNAL OF MATERIALS CHEMISTRY C, SCI Journal, May 2020

NANO ENERGY, SCI Journal, April 2020

NANOSCALE, SCI Journal, February 2020

JOURNAL OF MATERIALS CHEMISTRY C, SCI Journal, January 2020

NANOSCALE, SCI Journal, November 2019

DESALINATION, SCI Journal, November 2019

CHEMICAL ENGINEERING JOURNAL, SCI Journal, October 2019

NANOSCALE, SCI Journal, October 2019

JOM, SCI Journal, September 2019

CHEMICAL ENGINEERING JOURNAL, SCI Journal, August 2019

COMPOSITES PART B-ENGINEERING, SCI Journal, August 2019

NANOSCALE, SCI Journal, May 2019

ACS APPLIED MATERIALS & INTERFACES, SCI Journal, April 2019

FRONTIERS IN MATERIALS, SCI Journal, March 2019

ACS APPLIED MATERIALS & INTERFACES, SCI Journal, February 2019

ENVIRONMENTAL SCIENCE-NANO, SCI Journal, September 2018

JOURNAL OF MATERIALS CHEMISTRY A, SCI Journal, August 2018

ACS APPLIED MATERIALS & INTERFACES, SCI Journal, July 2018

NANOTECHNOLOGY, SCI Journal, June 2018

SOLAR ENERGY MATERIALS AND SOLAR CELLS, SCI Journal, April 2018

CHEMICAL ENGINEERING JOURNAL, SCI Journal, February 2018



## Metrics

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## Invited Talks

Metal Nanowire Networks: Promises, facts and challenges, Conference, International Conference on Advanced Materials Science and Engineering and High Tech Device Applications, Turkey, October 2020

Transparent Contacts With Metal Nanowire Networks , Seminar, South Korea, December 2018

## Awards

Ünalın H. E., Elginkan Vakfı Teknoloji Ödülü, Elginkan Vakfı, December 2020

Ünalın H. E., Bilim Akademisi Genç Bilim İnsanı Ödülü , Bilim Akademisi, April 2015

Ünalın H. E., TÜBİTAK Teşvik Ödülü , Tübitak, December 2014

Ünalın H. E., Eser Tümen Üstün Başarı Ödülü, Feyzi Akkaya Bilimsel Etkinlikleri Destekleme Fonu (Fabed) , October 2013

Ünalın H. E., Yılın Bilim İnsanı Ödülü , Bilim Kahramanları Derneği, June 2013

Ünalın H. E., Türkiye Bilimler Akademisi (TÜBA) Üstün Başarılı Genç Bilim İnsanı (GEBİP) Ödülü , Tüba, May 2009

## Entrepreneurship Activities

Limited, NANOVATİF MALZEME TEKNOLOJİLERİ ARAŞTIRMA GELİŞTİRME DANIŞMANLIK İTHALAT İHRACAT SANAYİ VE TİCARET LİMİTED ŞİRKETİ, 25 April 2017, Co-Founder

## Non Academic Experience

Orta Doğu Teknik Üniversitesi

Orta Doğu Teknik Üniversitesi

Cambridge Üniversitesi