

# **Tarek R. Farhat**

## **Curriculum Vitae**

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Tenure-Track Assistant Professor of Chemistry  
West Virginia University Institute of Technology  
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### **SUMMARY**

*Scientist with more than 12 years of teaching experience in chemistry. Hold a PhD (USA) in Analytical/Materials Chemistry, MSc (Canada) in Physical Chemistry, and BSc (UK) in Chemistry.*

### **COURSES AT WVU-TECH:**

**Lecture courses:** PHSC101, CHEM215, CHEM310, CHEM422, CHEM451

**Lab courses:** CHEM111L, CHEM115L, CHEM116L, PHSC101L, CHEM215L, CHEM313L, CHEM423L

### **EDUCATION**

- 07/2005      *Massachusetts Institute of Technology (Paula Hammond), Cambridge, MA*  
**Post doctorate, PEM Fuel cells, "NANOMATERIALS IN THE DESIGN OF SOFT FUEL CELL MODULES"**
- 12/2002      *Florida State University (Joseph Schlenoff) Tallahassee, FL*  
**PhD, Analytical/Materials Chemistry, Title of Thesis: "ION TRANSPORT IN POLYELECTROLYTE MULTILAYER MEMBRANES: ELECTROCHEMICAL, SPECTROSCOPIC, AND COMPUTATIONAL ANALYSIS"**
- 11/1993      *University of Victoria (David Harrington), Victoria, BC, CANADA*  
**MSc, Electrochemistry, Title of thesis: "KINETICS OF HYDROGEN/IODINE UNDER POTENTIAL DEPOSITION ON POLYCRYSTALLINE PLATINUM"**
- 7/1990      *University of Greenwich (Thames Polytechnic), London, UK*  
**BSc, First Class Honors, Chemistry**
- 6/1986      *West Thames College (Hounslow Borough College), London, UK*  
**GCE A-levels, Chemistry-Physics-Biology**

### **PROFESSIONAL EXPERIENCE**

08/13/2021 – Present    **Tenure Track Assistant professor of Chemistry, WVU-Tech, Beckley, WV, USA**

8/2020 – 5/2021      **Visiting Chemistry Faculty (Lecture/Lab), WVU-Tech, Beckley, WV, USA**

- 5/2019 – 8/2020 **Academic Lab Manager, WVU-Tech, Beckley, WV, USA**
- 12/2018 – 4/2019 **Online Chemistry Instructor, Grand Canyon University, AZ, USA**
- 01/2018 – 5/2018 **Visiting Chemistry Faculty (Lecture/Lab), West Virginia University, Keyser, WV, USA**
- 08/2016 – 6/2017 **Visiting Chemistry Faculty (Lecture/Lab), Penn State University, Fayette, USA**
- 6/2015 – 8/2016 **Chemistry Faculty (Lecture/Lab), Southwest Tennessee Community College, Memphis, USA**
- 5/2007–10/2016 **Technical Consultancy (Project and Technology Development), Industrial**
- 8/2005– 8/2011 **University of Memphis, Memphis, TN**  
**Assistant Professor, Analytical/Materials/Inorganic Chemistry**
- 1/2003-7/2005 **Massachusetts Institute of Technology, Cambridge, MA**  
**Postdoctoral Research Associate**
- 8/1999-12/2002 **Florida State University, Tallahassee, FL**  
**Research Assistant, Chemistry/Analytical Materials**

## **TECHNOLOGY HANDS-ON-EXPERIENCE**

**Chemical Engineering Systems:** (i) Gas separation PRISM system and interface to Gas analyzers & flow meters, (ii) Ion exchange and reverse osmosis systems, (iii) Carbon capture systems, (iv) Microfiltration System KrosFlo KR2i, (v) Bioreactor WINPACT Fermentation System, (vi) Fuel cell system design & characterization.

**Substrate dry/wet etching:** (i) used plasma etcher/cleaners (e.g. Harrick Plasma) to apply dry etching/cleaning on cut Silicon[100] wafers and other substrates. (ii) Wet etching/cleaning (e.g.  $H_2SO_4/H_2O_2$ , Aqua-regia,  $NH_3/H_2O_2$ ...) is applied to ceramic, glass, or patterned substrates.

**Automation/deposition:** (i) Design and assembly of Automated flow deposition system. Automation and control using VB code, solenoid valves, circuit boards, tubes, reservoirs, ...etc.  
(ii) Used robotic deposition system under software control to program number of layers deposited.  
(iii) Vapor deposition on substrates using Thermal & Sputter UHV/MVD system. Operation of diffusion/turbomolecular pumps, Quartz crystal microbalance to monitor thickness of thin films.

### **Materials synthesis/formulation, film deposition/patterning:**

- (i) Macromolecular (polymers, polyelectrolytes, proteins, ...etc.) patterns or films on surfaces;
- (ii) Molecular (organics, surfactants, ...etc.); salts/complexes (inorganics, minerals);
- (iii) Ceramics (crystals, wafers, powders, ...etc.);
- (iv) Gels (microcapsules, membranes, coatings, nano- & microfilms/patterns, ..etc.).
- (v) structural properties of chemical formula, polymer film thickness/pattern, polymer/powder matrix, powder matrix, particle size and surface potential,
- (vi) hydrophobic character, shore, stress/strain,

### **Instruments used for surface characterization:**

- (i) Plasma etch/activation system: etch/clean/functionalize of substrates or thin films.
- (ii)-Electrochemical/ Electro-analytical techniques (i.e. Cyclic/Pulse Voltammetry, ISE, AS, DMM, SFA, AC impedance, Potentiostat, Electro-plating/polishing, Oscilloscope, and electronic board design)
- (iii)-Optical spectroscopy techniques (e.g. UV-Vis, FTIR, ATR-FTIR, RAMAN, XRFs...etc),
- (iv)-Surface probe techniques (e.g. SEM, ESEM, TEM, EDX, AFM, XPS, Profilo-M., Ellipso-M., etc.), (vii) Rheology (Zeta potential & particle size, BET, DSC/TGA/DTG, LS, R.I., Viscometer, Stress/Strain), (viii) Contact angle, Polarimetry, and UHV systems.

### **Other Instruments used in materials characterization:**

- (i) Atomic spectroscopy (e.g. ICP-OES, ICP-MS, AAS, ... etc.),
- (ii) Chromatography (e.g. GC, HPLC, IC, GC-MS, GC-FTIR, GPC, ...etc.),

### **Coding skills**

- Programmer Microsoft Visual Basic (VBA, VB.net) and Visual Studio (VS) 2010-2022 Express platforms. Code/Software know how: C#, MATLAB, Lab-View (NI-DAQmx), Statistical analysis, Smart-Draw.
- Design of artificial intelligence tutoring systems dedicated for quantitative analysis

Model-Based Engineering (Heat Transfer & Mass transport): Monte Carlo Algorithm/diffusion laws to simulate complex diffusion mechanisms of molecules/ions/atoms across complex matrices (i.e. thin films, fluids, ...). Algorithm used Numerical analysis to simulate thermal profiles across hot melts/objects. (2D simulations using Visual Basic 2015)

## **SELECTED PUBLICATIONS**

**Farhat, T.R.**, "Numerical Analysis of Heat Transfer using "Sequential Transformation by Regression Factors" method, *United States Copyright office, #TXu 2-038-442, Jan, 31<sup>st</sup>, 2017.*

**Farhat, T.R.**, "Fluorinated Hydrogen Bonded Electrolytes of PVA/Nafion and PAH/Nafion Complexes, Electrochemical Applications", *ACS Book Chapter "Surfaces and Colloids"*, Chapter 7, pp 105-116, *ACS Symposium Series*, Vol. 1070, 09/ 19, **2011**.

Daniel G. Abebe, **Farhat, T.R.**, "Self-assembly of Nafion®/poly (vinyl alcohol) at pH = 1.2 and Nafion®/poly (allyl amine) at pH = 11, *Soft Matter*, **2010**, vol.6, issue 6, pp. 1325.

Mamidi, Sai Sree; Meas, Bo; **Farhat, T.R.**, "Rotational Hydrodynamic Diffusion System To Study Mass Transport Across Boundaries". *Analytical Chemistry* **2008**, 80(21), 8109-8114.

**Farhat, T.R.**, "Layer-by-Layer Assembly of Electroactive Thin Films to Layered Carbon Electrodes", *Review Dekker Encyclopedia for Nanoscience and Nanotechnology 2<sup>nd</sup> Edition*, **24**, March **2009**

Farhat, T.R.; **Hammond, P.T.** "Engineering Ionic and Electronic Conductivity in Polymer Catalytic Electrodes Using the Layer-By-Layer Technique", *Chemistry of Materials*, **2006**, 18(1), 41-49.

Farhat, T.R.; **Hammond, P.T.** "Fabrication of "Soft" Membrane Electrode Assembly Using Layer-By-Layer Technology", *Adv. Func. Mater.*, **2006**, 16, (3), 433-444.

Farhat, T.R.; **Hammond, P.T.** "Designing A New Generation Of Fuel Cells Using Layer-By-Layer Deposition Of Polyelectrolytes," *Adv. Func. Mater.*, **2005**, 15, 945.

Farhat, T.R.; **Schlenoff, J.B.** "Doping Controlled Ion Diffusion in Polyelectrolyte Multilayers, Mass Transport In Reluctant Exchangers". *Journal of the American Chemical Society*, 125(15), 4627-4636, **2003**.

Farhat, T.R.; **Schlenoff, J.B.** "Corrosion Control using Polyelectrolyte Multilayers" *Journal of Electrochemical Society, Solid-State Lett.* **5**, B13, **2002**. **Science News** online, "Steely Glaze: Layered electrolytes control corrosion", [www.sciencenews.org/articles/](http://www.sciencenews.org/articles/)

Farhat, T.R., **Schlenoff, J.B.** "Ion Transport and Equilibria in Polyelectrolyte Multilayers", *Langmuir*, **2001**, 17(4), 11841192.

## ***USA PATENTS:***

1. Apparatus for automatic depositing of multiple ultra-thin layers using layer-by layer deposition and method for using the same *From U.S. Pat. Appl. Publ. (2010), US 20100323106 A1 20101223, Language: English, Database: CAPLUS*
2. Layer-by-layer technology fabrication of carbon-polymer electrochemical systems  
*From U.S. Pat. Appl. Publ. (2006), US 20060062982 A1 20060323, Language: English, Database: CAPLUS*

## ***Selected SPEAKING ENGAGEMENTS& PRESENTATIONS***

- Farhat, Tarek R., "Demonstrating the Intelligence Capabilities of the Q-Electronic Tutor", *Abstracts of Papers, 249th ACS National Meeting*, Denver, CO, United States, March, 21-26, **2015**.
- Ramachandra, S., Farhat, T.R., *Preprint 239th ACS National Meeting and Exposition*, San Francisco, Division of Colloid and Surface Chemistry, Sunday, March 21, **2010**.
- Farhat, T.R., Abebe, D., *Abstracts of Papers 239th ACS National Meeting and Exposition*, San Francisco, Division of Colloid and Surface Chemistry, Sunday, March 21, **2010**.
- Farhat, T.R., *Abstract of Papers, 60th Southeast Regional ACS Meeting, 2008*, Nashville, Tennessee.
- Farhat, Tarek R., *Abstracts of Papers, 232nd ACS National Meeting, (Sep-2006)* San Francisco, CA, United States.
- Farhat, T. R., *Abstracts of Papers, 229th ACS National Meeting*, San Diego, CA, United States, March, 13-17, **2005**.