

ESDL Design Meeting Presentation Schedule

Date	Research Area	Presenter	Subject	Abstract
January 13, 2017		Marc Secanell	Annual State of the Lab Address	
January 27, 2017		Mayank Sabharwal	Part I - Improving FIBSEM using epoxy embedding resin Part II - Application of OpenFCST to Carbon Plate analysis	
February 3, 2017		Lisa Clare	Cooling Towers: Recap and Analysis	
February 10, 2017		Manas Mandal	Analysis of inkjet printed polymer electrolyte electrolyzer	
February 24, 2017		Vaishnavi Kale	Flywheel Optimization	
March 3, 2017		Alex Jarauta	Incompressible Fluid Flow and Water Transport in PEFCs	
March 10, 2017		Jie Zhou	Numerical Analysis in Understanding the Role of MPL on Fuel Cell Performance	
March 17, 2017		James Kracher	Water Management of Ultra-Thin Inkjet Printed Proton Conducting Membranes for PEMFCs	
March 24, 2017		Miles Skinner	Flywheel Energy Storage System Passive Energy Discharge Characterization	
		Jacob Follett	3D-Printing of Hydrogen Fuel Cell Microstructures	
March 31, 2017		Findlay McCormick	Bipolar Plate Design and Material Research	
		Kai Wang	Fabrication of Catalyst Coated Membrane for PEFCs	
		Jie Zhou	Analysis of Multiphase Flow in PEFC Using a Mixed Wettability Pore-size Distribution Model	
April 7, 2017		James Cook	Coolit: Open Source Cooling Tower Simulations	
		Jie Zhou	Analysis of Multiphase Flow in PEFC Using a Mixed Wettability Pore-size Distribution Model	
April 21, 2017		Hao Xu	Setup for Permeability and Diffusivity of PEM Fuel Cell Porous Media	
May 5, 2017		Lisa Clare	Cooling Towers: Experimental facilities update	
		James Cook	Open-source counter-flow simulation package	
		Alex Jarauta	Computational fluid dynamics software for cooling tower and droplet analysis	
May 12, 2017		Setute Hotor	Cell Segmentation and Current density distribution	
June 9, 2017	Cooling Towers	Lisa Clare	Cooling Tower Experimental Model - Update and Next Steps	Overview of the current status of the experimental model, upcoming design challenges regarding heating and airflow, and a description of next steps to be taken.
June 16, 2017	Fuel Cell Modeling	Alex Jarauta	Incompressible Fluid Flow and Water Transport in PEFCs	The new Schur complement-based solver will be reviewed, along with its implementation and results comparing with the current UMFPACK solver. The latest results of water transport in PEFC channels will be presented.
June 23, 2017	Fuel Cell Experiments	James Kracher	Monitoring and Managing Experimental Errors and Uncertainties	The fundamentals of experimental uncertainty analysis will be discussed. Managing and minimizing uncertainty is an important aspect for any experiment and is used to interpret results and determine their validity, and can also assist with the design of experimental setups
June 30, 2017	Flywheel Analysis	Vaishnavi Kale	Flywheel analysis model validation and literature review of MOO and MDO problems	Results from a comparative study of analytical and numerical models of the flywheel rotor will be presented. A literature review of various formulations for multi-objective and multi-disciplinary optimization problems is also discussed.
July 7, 2017	Fuel Cell Modeling	Abdul Azeem	Optimization of fuel cell MEA	Integration of Dakota and OpenFCST using python; Implementing it on a previously solved optimization problem and comparing the results.
		Aslan Kosakian	Transient cathode model in OpenFCST	The recently developed transient cathode model will be presented. Derivation of the transient form of the governing equations will be given and the current response results will be shown for several time-dependent voltage regimes and double layer capacitance values.
July 14, 2017	Fuel Cell Experiments	Stephan Voss	Durability and degradation of low loading electrodes	The durability of fuel cells is very important for a successful commercial commitment. Another point is the cost of fuel cells systems - especially the catalyst metal. Due to this, I examine the durability and of low loading electrodes and the influence of chemical degradation of the membrane.
July 20, 2017	FC Experiments - Electrolysis	Stephan Voss, James Kracher, Manas Mandal	Durability and degradation of low loading electrodes Experimental Analysis of Transient Water Fluxes in PEMFC's Analysis of inkjet printed polymer electrolyte electrolyzer electrodes	
		Peter Wagner	Degradation of HT-PEM Fuel Cells - The Difficult Way to Better Performance and Improved Long Term Stability	

July 28, 2017	Fuel Cell Experiments	Hao Xu	In-plane permeability of gas diffusion layer	Some updates of in-plane permeability setup will be discussed. The in-plane permeability of 3 differential GDL samples will also be presented, and the comparison with Gostick's paper
	Fuel Cell Modeling	Amin Nouri	Structure-performance modeling of transport layers in PEM fuel cells and electrolyzers	In PEM water electrolysis cells, we modeled the effect of oxygen bubble evolution and surface coverage at the interface of anode catalyst layer and Ti porous transport layer. In PEM fuel cells, we are modeling the effect of the MPL pore size distribution on the water transport away from the cathode catalyst layer using OpenFCST.
August 4, 2017	Cooling Towers	James Cook	ICTowers: An In-Depth View on the Underlying Software	In this presentation, we look at the software structure and go deep on how it works. This will not be about the science behind cooling towers, rather it will be a computer science based approach on the how and why the program was built the way it was.
August 18, 2017	Fuel Cell Modeling	Mayank Sabharwal	Microstructural and performance analysis of fuel cell electrodes	Exploring the relation between structure and composition and structure and performance for fuel cell porous media is important to design functionally optimized fuel cell electrodes. In this presentation, the current progress in the development of numerical tools to analyze the statistics and performance of fuel cell porous media microstructures will be discussed.
		Aslan Kosakian	Numerical modeling of transient phenomena in PEMFCs	A transient isothermal, single phase PEMFC model will be presented. Analysis of the dynamic fuel cell response to various time-dependent operating voltage scenarios will be performed, including ionomer water uptake over- and undershoots after sudden changes in voltage and hysteresis in polarization curves.
August 25, 2017	Fuel Cell Experiments	David Lauxmann	Fuel Cell performance with ionic liquid catalyst and Solid content study for inkjet printing	Presenting the first results of the ionic liquid catalyst and presenting the results of the Solid/Solvent study to find the best ink composition.
		Julia Hulstede	Fabrication and test of polymer electrolyte fuel cell electrodes using graphene based catalysts	Presenting the structural and electrochemical characterisation of graphene supported Pt catalysts. Showing an overview about the planned work regarding fabrication and test of PEM Fuel Cell electrodes.
	Fuel Cell Modeling	Aslan Kosakian	Numerical modeling of transient phenomena in PEMFCs	A transient isothermal, single phase PEMFC model will be presented. Analysis of the dynamic fuel cell response to various time-dependent operating voltage scenarios will be performed, including ionomer water uptake over- and undershoots after sudden changes in voltage and hysteresis in polarization curves.
September 1, 2017	Fuel Cell Modeling	Mayank Sabharwal	Microstructural and performance analysis of fuel cell electrodes	Exploring the relation between structure and composition and structure and performance for fuel cell porous media is important to design functionally optimized fuel cell electrodes. In this presentation, the current progress in the development of numerical tools to analyze the statistics and performance of fuel cell porous media microstructures will be discussed.
September 8, 2017	Flywheel Analysis	Miles Skinner	Characterization of passive discharge in a flywheel energy storage system	This thesis seeks to characterize these losses and create models which could be used to predict losses in future FESS. Empirical models are created from experimental data which are then used to quantify losses between zero and 5,000 RPM. It was discovered that electrical machine losses are by far the most most significant single source, followed by mechanical bearing and air friction.
	ESDLab Overview	Marc Secanell	State of the lab -- Fall 2017 edition	The Energy Systems Design Lab (ESDLab) aims at developing energy systems that are cost effective and have minimal environmental and socio-political impact. In this talk, an introduction to the lab experimental and numerical facilities, personnel and current projects will be provided followed by a summary of the ESDLab achievements and current project updates over the past four months.
September 15, 2017	PEMFC/E Experiments	Stephan Voss	Durability and degradation of low loading electrodes	The durability of fuel cells is very important for a successful commercial commitment. Another point is the cost of fuel cells systems - especially the catalyst metal. Due to this, I examine the durability and of low loading electrodes and the influence of chemical degradation of the membrane.
September 29, 2017	PEMFC/E Experiments	Manas Mandal	Analysis of Inkjet printed polymer electrolyte electrolyzer electrodes	CCM fabrication method determines a critical aspect of catalyst utilization. Inkjet's drop on demand allows accurate deposition, fabrication of low loading CCMs. The presentation objective is to demonstrate fabrication of electrolyzer CCM using IJP and characterizing the CCM.
October 6, 2017	PEMFC/E Experiments	Lowell McAllister	Embossing Carbon Composite Plates & Measuring In-Plane Conductivity of GDL	A summary of work done this summer. First, with regards to embossing and testing carbon composite material to be used as bipolar plates. Second, a summary of investigations into measuring the in-plane conductivity of GDLs. Third, I will give a brief update on work that has been done in the development of a fuel cell system for the UofA EcoCar team.
		Setute Hotor	PEM Segmented Cell Design and Current Sensing	An overview on the segmented cell will be discussed. The current sensing circuit and experimental setup will also be presented.
October 13, 2017	Cooling Towers	Lisa Clare	Cooling Tower Experimental Model - Current Status and Challenges	An update on the progress made over the past months on the physical model of a counterflow induced-draft wet-type cooling tower, including current and future challenges.

October 20, 2017	PEMFC/E Modeling	Elaf Mahrous	Introduction to Kratos Multi-physics Frame-work, and Brief Overview of Surface Tension	Modeling a meso-scale droplet requires a reliable modeling tool; beside, it is important to understand the physics behind the jetting phenomena. Here, I am going to introduce Kratos Multi-physics open source software. Then, sharing the basic physics behind the surface tension phenomena.
October 27, 2017	PEMFC/E Modeling	Vaishnavi Kale	Numerical optimization framework for design of energy systems	An in-house python module was developed to provide an interface between optimization packages and physical models for flywheels and fuel cells. Examples of optimization studies performed for flywheel rotor design and local contact angle estimation for GDLs will be discussed.
November 3, 2017	PEMFC/E Experiments	James Kracher	Experimental Analysis of Transient Water Fluxes in PEMFC's	A brief look into the opening slides for my thesis defense
November 10, 2017	PEMFC/E Experiments	Julia Hulstede	Investigation of graphene based platinum catalysts in low temperature polymer electrolyte membrane fuel cells	Two different graphene based catalysts were investigated and compared with platinum on carbon black. An overview about the final results of CCM fabrication using inject printing and the electrochemical characterization is presented.
November 17, 2017	PEMFC/E Modeling	Jie Zhou	Oxygen sweep study with experimental data using OpenFCST	Three samples with different CL thickness have been analyzed using OpenFCST. With a lower CL thickness, the catalyst utilization has been improved.
November 24, 2017	PEMFC/E Modeling	Michael Moore	Introduction to electrolyser modelling	Introduction to the equations used in electrolyser modelling, along with the expected/potential research to be undertaken. Includes a paper review of a model that attempts to describe the mass transport effect of bubble formation in the anode.
December 8, 2017	PEMFC/E Experiments	Wei Fei	Temperature measurement of PEMFCs	Temperature measurement of PEMFCs is required as it greatly affect PEMFCs' performance and aging; besides, the measured temperature can be used to calculate thermal conductivity. With temperature and thermal conductivity results, we are able to validate modeling results. In this presentation, a in-situ set-up and an ex-situ set-up, refered from literatures, are introduced. In addition, one preliminary temperature measurement instrument along with its application are discussed.
December 15, 2017	Cooling Towers	Alex Jarauta	Incompressible Fluid Flow Modeling in PEFCs using OpenFCST	The new Schur complement-based solver for incompressible flows has been recently included in the latest verison of OpenFCST. A short overview on how it is meant to be used will be given, as well as a discussion on those classes that can be used by all users.