

## Batteries, Super Capacitors, Fuel Cells & xEV's Seminar

July 8-10, 2014 - Munich, Germany

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Prof. Doron Aurbach and Shmuel De-Leon in partnership with Ice Seminars invite you to join a unique seminar.

The seminar program focuses on present and future needs of portable and stationary electrochemical energy sources and highlights the latest technological developments designed to satisfy application requirements.

The seminar program will discuss worldwide state-of-the-art energy storage of raw materials and technology development (Anode, Cathode, Electrolyte, separators, binders and other battery components) as well as primary, rechargeable, reserve, commercial, industrial and military batteries, fuel cells, ultra capacitors, chargers systems and their accessories.

The seminar program will review typical cycle life aspects of designing and manufacturing energy source solutions: from application energy requirements, power source electrical and mechanical design, cells selection, cells evaluation tests, battery prototype, acceptance tests, design and manufacturing techniques, testing, mass production, safety issues, transportation, use and disposal.

Special attention will be given to:

- Advances in new and improved materials for anode, cathode, electrolyte, separators including nano-materials
- In-depth worldwide analysis of battery market and technologies
- Consumer, Industrial, Military and large format batteries
- Battery development for the grid
- Advances in battery packs, charging and testing
- Battery safety enhancement
- Battery air transportation regulations
- Battery recycling

The seminar will also review and compare xEV's batteries, Fuel Cells and Metal air systems energy solutions.

### Key Benefits

The Batteries & Fuel Cells Seminar provides:

- Full review of current and future electrochemical energy sources research and raw materials.
- Full review of current and future electrochemical energy sources for different applications.
- Training on cells and raw material selection, design, manufacturing, testing, safety, transportation and disposal aspects of energy sources.

## Who should attend?

Batteries, Fuel Cells manufacturers  
Batteries, Fuel Cells energy sources users  
OEMs  
Equipment and material suppliers  
Pack assemblers  
Application engineers  
Energy sources suppliers  
Academic researchers  
R&D engineers  
Market analysts  
Safety supervisors  
Battery shippers and disposers  
EV, Plug-In, Hybrid manufacturers  
Others industry members  
Anyone who wants to increase their power sources background knowledge

## About Prof. Doron Aurbach

DORON AURBACH is a full professor in the department of Chemistry, leading the electrochemistry group (40 people), a senate member at Bar Ilan university (BIU). He chaired the department of chemistry during 2001-2005. Aurbach and his team study the electrochemistry of active metals non-aqueous electrochemical systems, develop spectroscopic methods (in situ and ex situ) for sensitive electrochemical systems, study electrochemical intercalation processes, electrochemical water desalination and develop rechargeable high energy density batteries and EDL capacitors. The group published so far more than 430 peer reviewed papers. D. Aurbach serves as an associate editor in 3 electrochemistry journals: EES, JES (journals of the Electrochemical Society) and J. Solid State Electrochemistry (Springer). He is a fellow of the ECS, ISE and MRS. He is the head of INREP: Israel national research center for electrochemical propulsion and the chairman of the Israeli national authority for labs accreditation. He received the ECS battery division technology award (2005), the Israel vacuum society (IVS) and Israel chemical society (ICS) excellence prizes (2007, 2012), the Landau prize for research towards green energy (2011), the ECS battery division research award and the Kolthoff prize (2013).

## About Shmuel De-Leon

Shmuel De-Leon is the Founder and CEO of Shmuel De-Leon Energy, Ltd. Shmuel is a leading international expert in the field of Power Sources. Prior to founding the company, Shmuel held various positions as a power sources, engineering and quality control team manager for over 20 years. Shmuel holds a B.Sc. in mechanical engineering from Tel-Aviv University and an M.Sc. in quality control and reliability engineering from the Technion Institute in Haifa as well as an Electronic Technician's diploma.

Shmuel De-Leon Energy Ltd. provides unique tools for the energy sources industry, such as the Energy Sources Database, Battery & Fuel Cells Seminar, Energy Sources Solutions, Industry News weekly newsletter, and consultations.

**Agenda:**

<b>Tuesday, 8/7/2014 – Speaker: Prof. Doron Aurbach</b>	
08:00 – 09:00	<b>Registration</b>
09:00 – 10:00	<p><b>Basic Principles of Advanced Batteries and Super Capacitors, Most Important Types and How They Work.</b></p> <p>In this session, we will explain how batteries and super-capacitors work. Review in brief the most important types of batteries: primary, secondary, aqueous, non-aqueous, stationary, flow and more. Some basic principles of electrochemical energy storage &amp; conversion. We will also mention fuel cells in order to complete the picture.</p>
10:00 – 11:00	<p><b>Review of Main Battery Problems</b></p> <p>The most important components of batteries, their selection and structure including limitations of battery systems in terms of voltage, capacity, energy &amp; power density, and cycling. Failure mechanisms of Li, Li ion, lead acid batteries. Thermal behavior of batteries, possible thermal run-away events. Basic safety matters in production, operation, recycling. Temperature limitations (low, high), impedance development (detrimental surface phenomena) and bulk degradation upon cycling rechargeable batteries.</p>
11:00 – 11:15	<b>Coffee Break</b>
11:15 – 12:15	<p><b>Which Experiments to Select and Correctly Read Basic Electrochemical Data</b></p> <p>Electrochemical techniques, spectroscopic and microscopic tools for the analysis of batteries and battery components. Basic electrochemical response of electrodes and battery systems. Correct design of experiments. Important techniques such as chrono-amperometry, chrono-potentiometry, cyclic voltammetry, electrochemical titration techniques (PITT, GITT) and impedance spectroscopy.</p>
12:15 – 13:00	<p><b>Review Anode &amp; Cathode Materials for Li Rechargeable Batteries</b></p> <p>Most important anode and cathode materials for Li and Li ion batteries. Examine characterization tools and routes. Review main structures of Li intercalation compounds: carbons, graphite, lithiated transition metal oxides and Li metal olivines. Examine Li intercalation reactions, Li alloying reactions (e.g. with silicon, tin, binary and ternary metallic compounds and Li conversion reactions as main electrodes reactions in Li ion batteries). Discuss air and sulfur electrodes, in relevance to Li batteries.</p>
13:00 – 14:00	<b>Lunch Break</b>
14:00 – 15:00	<p><b>Review Electrolyte Solutions for Li Batteries</b></p> <p>Various aspects of electrolyte solutions for Li batteries: relevant families of non-aqueous solvents, how to choose and how to characterize, relevant Li salts available and the criteria for their selection. Electrochemical windows, ionic conductivity – how it is determined and measured (including temperature effects). Main reactions that limit the electrochemical windows of electrolyte solutions for Li batteries. Possible gas formation, passivation phenomena, thermal reactions and the conditions for electrochemical and thermal stability. Describe in brief some solid electrolytes: gels, polymeric matrices, ceramic electrolytes.</p>
15:00 – 16:00	<p><b>Review Battery Engineering Aspects- Current Collectors, Separators, Conductive Additives</b></p> <p>'Non reactive' components in batteries: case, current collectors, separators, conducting additives, may be critically important for the good performance of batteries. The right selection of current collector materials, their stability and involvement in parasitic side reactions. Structures &amp; properties of separators. Main aspects of composite electrodes preparation, the use of various conductive additives and their effect on the passivation properties of the electrodes. Structure-performance correlations, concentrating on engineering aspects.</p>
16:00 – 16:15	<b>Coffee Break</b>
16:15 – 17:00	<p><b>Review Electrodes for Super Capacitors</b></p> <p>Classify symmetric and a-symmetric capacitors, real electrical double layer capacitors (EDLC) and pseudo-capacitors, in which the electrodes contain surface red-ox moieties. How to prepare and characterize high surface area activated carbon electrodes for EDLC. Aqueous vs. non-aqueous EDLC – advantages and limitations. Relevant electrolyte solutions. Compare batteries and super-capacitors and examine how they complement each other.</p>
17:00 – 17:30	<p><b>Metal Air Batteries: Challenges, Reality &amp; Chances for Success</b></p> <p>Review in brief aqueous Al &amp; Zn air batteries. Options to operate Li-air batteries (single or double compartments systems). Experiences accumulated with Li-air batteries, problems and chances for success. Examine the chances to develop rechargeable Li and Na batteries.</p>
17:30 – 18:00	<p><b>Where Can We Go with Power Sources for EVs? What is the Reality and How We Can Make the EV Revolution Valid</b></p> <p>This part is a summarizing chapter. We will take into account all the information conveyed to discuss optimization of power sources for EV. Examine how to select the right power sources, the most important parameters, the realistic expectation in terms of performance and how to combine various types of complementary power sources for EV applications.</p>

<b>Wednesday, 9/7/2014 – Speaker: Shmuel De-Leon</b>	
08:00 – 09:00	<b>Battery Characteristics</b> This session introduces a historical prospective of batteries, detailed battery definitions and features (electrical, mechanical, standards, etc.) and lays the foundation for the attendants to share a common “battery language” and provides all the background needed for upcoming sessions.
09:00 – 10:00	<b>Primary Cells &amp; Batteries</b> Reviews and compares primary battery chemistries (Alkaline Manganese Dioxide, Zinc Carbon, Zinc Chloride, Silver Zinc, Nickel Oxyhydroxide, Lithium Iron Disulfide, Lithium Iodine, Lithium Manganese Dioxide, Lithium Carbon Monofluoride, Lithium Sulfur Dioxide, Lithium Thionyl Chloride, Lithium Sulfuryl Chloride, Lithium Bromine Chloride and High Power Organic Lithium). Market review of the main manufacturers.
10:00 – 10:15	<b>Coffee Break</b>
10:15 – 11:30	<b>Rechargeable Cells &amp; Batteries</b> Reviews and compares rechargeable batteries chemistries (Nickel Cadmium, Nickel Metal Hydride, all families of Lithium Ion, Lithium Polymer and Lithium Metal) and also describes the current market status and future developments. Market review of the main manufacturers.
11:30 – 12:00	<b>Lithium Rechargeable Cells Manufacturing Process</b> Reviews of lithium rechargeable conventional and pouch cells manufacturing process
12:00 – 13:00	<b>Lunch Break</b>
13:00 – 13:30	<b>Chargers</b> Reviews battery chargers, inputs and outputs, charging techniques per battery chemistry, charging problems and solutions, personal chargers, industrial chargers and charger types by charging time.
13:30 – 14:15	<b>Military Batteries</b> Reviews and compares military batteries & chargers (primary, rechargeable batteries). Market review of the main manufacturers.
14:15 – 14:45	<b>Thermal &amp; Reserve Batteries</b> Reviews and compares Thermal and Reserve batteries (Thermal Batteries, Reserve Lithium Batteries, Reserve Zinc Air, Reserve Magnesium Silver Chloride and Reserve Silver Zinc).
14:45 – 16:00	<b>Battery Design Process &amp; Optimization</b> Battery design processes (cell and raw materials selection, cell level testing, battery design documents, battery electrical, mechanical and safety design and final verification tests (electrical, mechanical, safety).
16:00 – 16:15	<b>Coffee Break</b>
16:15 – 17:30	<b>Battery Safety</b> Safety risks along the battery cycle life and provides safety guidelines for safety event elimination. Addresses the procedures involved in handling safety events, including first aid.
<b>Thursday, 10/7/2014 – Speaker: Shmuel De-Leon</b>	
08:00 – 09:00	<b>ICE Seminars Presentation</b>
09:00 – 09:30	<b>Battery Disposal</b> Battery disposal requirements and updates disposal status in Europe and the US.
09:30 – 10:00	<b>The “Smart Batteries”</b> “Smart Battery” technology, including single wire and smart battery communications bus, Battery Management Systems and advantages.
10:00 – 10:15	<b>Coffee Break</b>
10:15 – 10:45	<b>Battery &amp; Fuel Cells Testing Systems</b> Battery and Fuel Cells testing techniques, available systems in the market and their features.
10:45 – 11:30	<b>Energy Storage for the Grid</b> Reviews Energy storage systems for the grid
11:30 – 12:15	<b>Fuel Cells</b> Reviews and compares fuel cell types and their market status (Alkaline, Molten Carbonate, Phosphoric Acid, Proton Exchange Membrane, Solid Oxide and Direct Methanol) and the main fuel cells manufacturers and developers.
12:15 – 13:15	<b>Lunch Break</b>
13:15 – 14:00	<b>Super Capacitors</b> Super Capacitors advantages, disadvantages, technology review
14:00 – 15:00	<b>EV Energy Solutions</b> Reviews and compares EV Batteries, EV Fuel Cells, EV Metal Air systems, EV Battery SWAP and EV
15:15 – 15:30	<b>Coffee Break</b>
15:30 – 16:30	<b>EV Energy Solutions</b> Reviews and compares EV Batteries, EV Fuel Cells, EV Metal Air systems, EV Battery SWAP and EV Battery chargers. Main industry problems will be discussed along with a future forecast.

## Seminar Registration Form

### Seminar Schedule

The seminar is 3 days long, July 8-10, 2014

### Seminar Location

Orbis – Das Seminarraumkonzept

Bruckmannring 32, 85764

Oberschleibheim/ Greater Area Munich

<http://www.orbis-muenchen.de/seminarraeume.html>

### Pricing

- 1858 Euro for 3 days seminar per attendee
- 929 Euro for Prof. Aurbach 1 day seminar per attendee
- 929 Euro for Shmuel De-Leon 2 days seminar per attendee
- 10% discount for 3+ group attendees
- 10% discount for Government worker attendees (Copy of a valid Government ID required)
- 10% discount for Academic Institute attendees (Copy of an Academic Institute ID required)
- Pricing includes hard copy print out of all seminar presentations and slides, lunch and refreshments
- Special pricing for in-house seminars

### Payment

All payments must be made in European funds drawn on a German bank. Please make check(s) payable to ICE Seminars and attached to the registration form even if you have registered by phone, fax or e-mail. To guarantee your registration, payment must be received prior to the seminar. Confirmation of your booking will follow.

Payment can also be made electronically using all major credit and debit cards. An extra 40 Euro processing fee will apply. For all electronic payments, a copy of an electronic invoice will be e-mailed to the e-mail address provided on the Seminar Registration Form.

### Exhibit & Sponsor

Exhibitor and Sponsor will receive:

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Please send the completed pre-registration form to Shmuel De-Leon Energy Ltd. by email: [shmuel@sdle.co.il](mailto:shmuel@sdle.co.il)

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