

Historical

History of primary cells

History of secondary cells

History of fuel cells

History of supercapacitors

History of Electrochemistry

Basics: Electrolytes

Electrolyte Basics

Non-aqueous

Ionic Liquids

Polymer

Gel

Solid Sodium and Sodium-Beta aluminas

Solid Oxygen

Solid Protons

Basics: Electrodes

Double Layer

Electrokinetics

Hydrogen evolution

Oxygen evolution

Corrosion

Porous electrodes

Intercalation electrodes

Semiconductor electrodes

Basics: Cells

Thermodynamics

Kinetics

Photoelectrochemical Cells

Modeling Batteries

Modeling Fuel Cells

Lithium polymer batteries

Cell Nomenclature

Sign conventions, quantities and units for power sources

Basics: Cell parameters

Capacity

Energy

Power

Self-discharge

Efficiency

Lifetime

AC influence on charge

Charge discharge curves

Basics: Synthesis

Sol-gel

Basics: Nanotechnology

Template syntheses and nanoelectrodes

Nanofibers

Basics: Elements

Chemistry and Electrochemistry of Zn

Chemistry and Electrochemistry of Ni

Chemistry and Electrochemistry of Fe

Chemistry and Electrochemistry of Ag

Chemistry and Electrochemistry of Li

Hydrogen Storage in Complex Hydrides

Chemistry and Electrochemistry of O₂

Basics: Measurement techniques

Impedance Spectroscopy

Linear sweep and cyclic voltammetry

Step (U, I) experiments

SEM

TEM

AFM

Principles of X-ray and neutron diffraction and its relevance in the battery field

XPS

Measurement Techniques: Vibrational Spectroscopy (Raman, IR)

In situ water visualization in electrochemical power sources by means of neutron and synchrotron imaging

Electrochemical quartz crystal microbalance

X-ray Absorption Spectroscopy

Basics: Handling techniques

Etching

General

Hydrogen Economy

Hybrid Car

Electric Car

Energy storage

Combined-cycle processes

Cold Fusion - Precursor to Low-Energy Nuclear Reactions

Primary Batteries: general

Principles of primary cells

Primary Batteries: aqueous systems

Leclanche cells, zinc-carbon dry cell

Alkaline manganese zinc batteries

metal air batteries

zinc air batteries

Secondary Batteries

Iron Air Batteries

Primary Batteries: Aqueous systems

Zinc mercury batteries

Primary Batteries: nonaqueous liquid systems

Lithium primary batteries

Lithium-Iodine pacemaker batteries

Li-Sulfur/Chlorine primary systems

Lithium-vanadium pentoxide and lithium-silver vanadium oxide primary batteries

Lithium-polycarbon monofluoride batteries

Lithium-manganese dioxide batteries

Primary Batteries: nonaqueous solid state systems

Solid electrolyte batteries

Primary Batteries: Thermal batteries (General)

Primary Batteries: heat activated batteries

Calcium (negative electrode) thermally-activated batteries

Lithium (negative electrode) thermally-activated batteries

Primary Batteries: Thermally activated batteries

Magnesium seawater-activated batteries

Secondary Batteries: general

Principles of secondary cells

Secondary Batteries: lead-acid battery

lead-acid battery (LAB) general

LAB, lead alloys

LAB curing/formation

LAB positive electrode

Electrodes

LAB negative electrode

LAB electrolyte

LAB separators

LAB performance

Grid Production

Lifetime determining processes and life time prediction of batteries

LAB, flooded

Catalytic valves

VRLAB/ The oxygen cycle

LAB AGM

LAB gel

Bipolar designs

LAB charging

LAB application - stationary

Applications: Future Automotive

LAB Applications-new automotive

LAB State-of-charge-health

LAB Flow designs

LAB Modeling

Carbon in LABs

Secondary Batteries: nickel batteries

Nickel cadmium battery NiCd (Gen)

NiCd Sealed type

Nickel-Iron battery

Nickel-zinc battery

Nickel hydrogen

Nickel metal hydride (general)

nickel electrodes

Memory effect of nickel batteries

Cadmium Electrodes

iron electrodes

metal hydride alloys

Secondary Batteries: Zinc Electrodes

Secondary Batteries: zinc batteries

zinc air - Hydraulic recharge

zinc air - Electrical recharge

Zinc electrodes: Solar thermal production

rechargeable alkaline manganese dioxide: zinc battery

Secondary Batteries: zinc batteries

Zinc silver

Secondary Batteries

Silver-based batteries

Redox-flow batteries

redox-flow battery: Vanadium redox

Secondary Batteries: HT-batteries

sodium sulfur

zebra battery

Secondary Batteries: lithium batteries

Lithium sulfur cells

Secondary Batteries: Lithium iron sulfide batteries

Secondary Batteries: lithium batteries

lithium-air battery

Rechargeable lithium batteries

lithium ion batteries (General)

Lithium-organic sulfur rechargeable batteries

Carbon negative electrodes for rechargeable lithium batteries

Graphite negative electrodes for rechargeable lithium batteries

Lithium alloy negative electrodes for rechargeable lithium batteries

Lithium metal negative electrode for rechargeable lithium batteries

Secondary Batteries

Lithium batteries with inorganic electrolytes

Positive electrode materials for lithium batteries

Secondary Batteries: Li-batt materials

lithium cobalt oxide

lithium nickel oxide

Layered mixed transition metal oxides

manganese oxide of spinel structure

High-voltage positive electrode materials for lithium-ion batteries

Manganese dioxides and lithium manganese dioxides as positive electrode materials in lithium batteries

Materials: pos and/or neg electrode

Titanium based negative electrode materials for lithium ion batteries

Secondary Batteries: Li-batt materials

Li transition metal phosphate positive electrode for rechargeable lithium batteries

Electrolytes and Interfaces

Nonaqueous Electrolyte for Lithium Batteries

The use of additives in organic electrolyte solutions for lithium batteries

separators for rechargeable lithium batteries

solid state cells

oxide electrolytes conductive for Li ion

Sulfide electrolytes conductive for Li ion

Glass electrolytes for rechargeable lithium batteries

Vanadium oxide positive electrode for rechargeable lithium batteries

lithium ion polymer batteries

Materials: pos and/or neg electrode

Spinel type lithium titanium oxide for lithium ion batteries

Lithium ion batteries consisting of metal oxides for both positive and negative electrodes

Fuel Cells: Introduction to FCs

Fuel Cells: PEMFC

PEMFC Anodes - Reformate

PEMFC Cathodes

PEMFC Gas Diffusion layers

PEMFC Gas-flow fields

PEMFC Membrane Electrode Assemblies

PEMFC Cells

PEMFC Stack Architecture

PEMFC Electrolytic Membranes (General Introduction - classes, issues, etc)_

PEMFC Ambient temperature membranes

Elevated temperature PEMFC membranes

PEMFC General performance and operational conditions

PEMFC life-limiting considerations - Catalyst

PEMFC life-limiting considerations - Membrane

PEMFC Freeze

PEMFC Systems

Dynamic Responses of Polymer Electrolyte Membrane Fuel Cells

Fuel Cells: Direct Alcohol FC

Introduction to Direct Alcohol Fuel Cells

DMFC - general

DMFC: General performance and operational conditions

Direct ethanol fuel cells

Direct Alcohol Experimental Systems

Direct Alcohol New materials

Fuel Cells: Solid Oxide FCs

Solid Oxide Fuel Cells - Introduction

SOFC Anodes

SOFC Cathodes

SOFC: gas distribution

SOFC: cell interconnection

SOFC: cells and stacks, general performance and operational conditions

SOFC high-temperature Membranes

SOFC - internal and external reforming

SOFC: life-limiting considerations

FSystems

Fuel Cells: MCFCs

Molten Carbonate Fuel Cells - Introduction (general characteristics)

MCFC Anodes

MCFC Cathodes

MCFC cells and stacks

Carbonate Fuel Cells Technology and Products

MCFC Materials and Life Considerations

MCFC Systems

MCFC Cell and Stack Modeling Progress

Fuel Cells: Phosphoric Acid

PAFC Introduction (General history and characteristics)

PAFC Anodes

PAFC Cathodes

PAFC cells and stacks

PAFC Electrolyte

PAFC General performance and operational conditions

PAFCs life-limiting considerations

PAFC Systems

Fuel Cells: AFC

AFC cells and stacks

AFC General performance and operational conditions

AFC Systems

Fuel Cells: Special FC

Regenerative Fuel Cells

Advanced Fuel Cells - Biological Fuels and Concepts

Fuels - Hydrogen production

H₂-Production - Natural Gas, Conventional steam-reforming

H₂-Production - Natural Gas, solar-thermal reforming

H₂-Production - Autothermal reforming

Hydrogen and Methane for Fuel Cells

via Absorption Enhanced Thermochemical Biomass Conversion

Fuels - Hydrogen Production

H₂-Production - Coal Gasification

Syngas cleaning - barrier filters: ceramic and metallic

Gas separation - pressure swing adsorption

Membrane Technology for Gas Separation

H₂-production from fermentation of biomass

H₂-Production - Biomass:thermal

Fuel - Hydrogen from water

Electrolyzers

Dye-Sensitized Solar Cells

Photo-thermal and thermally assisted PV/electrolytic decomposition

Photoelectrochemical cells

Thermochemical cycles - General

Fuels - Hydrogen storage

Hydrogen Storage as compressed gas

Hydrogen storage as liquid

Hydrogen storage in normal T hydrides

Hydrogen storage in high T hydrides

Hydrogen storage in carbon materials

Hydrogen storage in metal organic frameworks

Hydrogen storage in zeolites

Hydrogen Storage in Chemical Hydrogen Carrier and Chemical Hydrides

Hydrogen storage in glass microspheres

Fuels - Hydrogen safety

Hydrogen Transportation

Fuel Cell Applications

Fuel Cell powered Buses

FCs in Marine applications (Boat and submarine Fuel cells)

Fuel cells for light traction

Fuel cell for aviation applications

FCs in Stationary Applications

Residential fuel cells

FCs for Uninterruptible power (back-up power supplies)

Fuel Cells for Portable Electronics

Supercapacitors

Capacitors - general

Electrostatic solid-state capacitors

Carbon materials for supercapacitors

Electrochemical double-layer capacitors

Electrochemical capacitors - metal oxide

Polymer technology

Hybrid Technology

Capacitors application

Applications: Portable

Batteries for Portable Devices

Lap-tops

Military

Power tools

Applications: Transportation

Batteries for HEV

Basics: Transportation

Fast charging

Applications: Transportation

APU

Applications: Aircraft Batteries

Applications: Transportation

Submersible

Electric Bicycles

Fuel-Cell Rail Vehicles

Energy Supply for satellites from electrochemical power sources

Solar Vehicles

Application: Stationary

RAPs

The Application of Stationary Energy Storage Systems

Safety: HT-systems

Na⁺ systems

Safety: special effects

High voltage

Materials toxicity

Thermal runaway

Cell reversal

Short circuit

Codes and Standards

RAPS

Recycling

NiMH batteries

Lead-acid batteries

Lithium recycling

Noble metal recycling

Fuel Cells

Modeling of direct alcohol fuel cells

Fuel Cells: Solid Oxide FCs

SOFC modeling

Fuel Cells

PEMFC Modeling

Supercapacitors

Design of ionic liquid-based supercapacitors

Secondary Batteries: Li-batt materials

Ionic Liquids

Basics: Elements

Chemistry and Electrochemistry of Carbon

Chemistry and Electrochemistry of Platinum group elements

Chemistry and Electrochemistry of Manganese

Safety

Hydrogen

Fuel Cells

sodium borohydride fuel cell

Basics

electrocrystalization

Ion-Selective Electrodes

Applications

Parallel and series connections

Life time predictions of Batteries

Secondary Batteries

Separators for secondary alkaline batteries

Fuel Cells

High temperature PEFC

Secondary Batteries

Zinc Bromine

Primary Batteries

Nonaqueous primary and secondary magnesium batteries

PEMFC

Hydrogen-Bromine FC

Fuel Cells

Water Management in PEMFCs

Aviation Applications of Fuel Cells

Formic Acid Fuel Cells

Basic: Elements

Chemistry and Electrochemistry of Hydrogen

Fuel Cells: General

Lifetime prediction of Fuel Cells

Application

Electrochemical recycling of LAB

Basics

NEMCA (Non Faraday Electrochemical Modification of Catalysts)

Secondary Batteries: lithium batteries

Thermal runaway of lithium batteries

PEMFC

PEMFC systems- Fuel and air impurities

Lead Acid Battery

Partial State of charge

PEMFC

Direct Ethylene Glycol Fuel Cells

Basics

Modeling of Membranes

Application: Transportation

ICE-Battery Hybrid Buses

Basics

Charging Methods

PEMFC

Non-Fluorinated Fuel Cell Membranes

Macro Cycle Catalysts for PEM fuel cells

Basics

3-D batteries

Single lithium ion conducting polymer electrolytes

Applications, portable

hybrid systems of capacitor and micro fuel cells

PEMFC

Degradation of PEMFC - General

Composite membranes for PEMFCs

Basics: Elements

Chemistry and Electrochemistry of Lead

Fuel Cells, PEMFC

Design and Characterization of Alternative Proton Exchange Membranes for Automotive Applications

Basics, electrolytes

Mixed Ionic-electronic conductors (MIEC)

Basics

AMTEC Energy Converter

FC, SOFC

SOFC - Gas Turbine Hybrid System

Direct Carbon Fuel Cell

FC, PEMFC, Direct Alcohol FCs

MEMS Micro- PEM Fuel Cells

FC, Direct Alcohol FCs

Catalysts for Direct Ethanol Fuel Cells

LAB

LAB “coup de fouet”

Li batteries

Life prediction for lithium ion batteries

Secondary batteries, FCs

Bifunctional Oxygen Electrodes

Li Batteries

Ageing mechanisms in lithium-ion batteries

FC-SOFC

Micro SOFCs

PEMFC

Advanced Fluorinated Membranes

Super-Iron Battery

Membranes based on polybenzimidazole

UltraBattery

Anion Exchange Membranes for Fuel Cells

Spatially resolved measurements for PEMFC membranes

In-situ methods for battery materials

In situ methods for the characterization of battery materials

Dynamic of Batteries

Techno-Economic Assessments of Fuel Cells and Batteries

Phosphoric acid influence on lead-acid batteries

Cold Fusion

The History of Cold Fusion

Chemistry and Electrochemistry of Aluminum

Adaptive State-of-Charge determination of Li-ion batteries

Overcharge protection shuttles for lithium ion batteries

Plug-In Hybrid Electric Vehicles & Extended-Range Electric Vehicles