This meeting will be co-sponsored
by The Electrochemical Society

BRNO UNIVERSITY OF TECHNOLOGY
FACULTY OF ELECTRICAL ENGINEERING AND COMMUNICATION

12th ABAF

BRNO 2011

Advanced Batteries, Accumulators and Fuel Cells

INTERNATIONAL CONFERENCE

September 11th - September 14th 2011

Organised by:

Department of Electrotechnology,
Faculty of Electrical Engineering and Communication,
Brno University of Technology

Organizing committee:
Jiří Vondrák
Marie Sedlaříková

Title:	Advanced Batteries Accumulators and Fuel Cells – 12th ABAF
Edited:	Jiří Vondrák Vítězslav Novák Petr Bača
Publishing Office:	Vítězslav Novák Petr Bača
Deadline:	August 15th 2011
Publisher:	Brno University of Technology Faculty of Electrical Engineering and Communication Department of Electrotechnology
Press:	Tribun EU s.r.o., Cejl 892/32, Brno 602 00
Year:	2011
Number of Copies:	85

ISBN 978-80-214-4310-5

A VIABLE PATH TOWARD A HIGH ENERGY DENSITY ANODE FOR LITHIUM-ION BATTERIES

Ferrara, G.[1], Vergottini, F.[2], Mistretta, M. C.[2], Randazzo, S.[1], Damen, L.[3], Inguanta, R.[2], Arbizzani, C.[3], Guidotti, M.[3], Piazza, S.[2], Albanese, A.[1], Bargauan, M.[1], Sunseri, C.[2], Mastragostino, M.[3]

[1] CR Mobility Solution System S.R.L.- Via Torrearsa, 24, Palermo, Italy
[2] Dipartimento di Ingegneria Chimica, Gestionale, Informatica, Meccanica – Università di Palermo, Viale delle Scienze Ed. 6 – Palermo, Italy
[3] Dipartimento di Scienza dei Metalli, Elettrochimica e Tecniche Chimiche – Via San Donato, 15 – Bologna, Italy

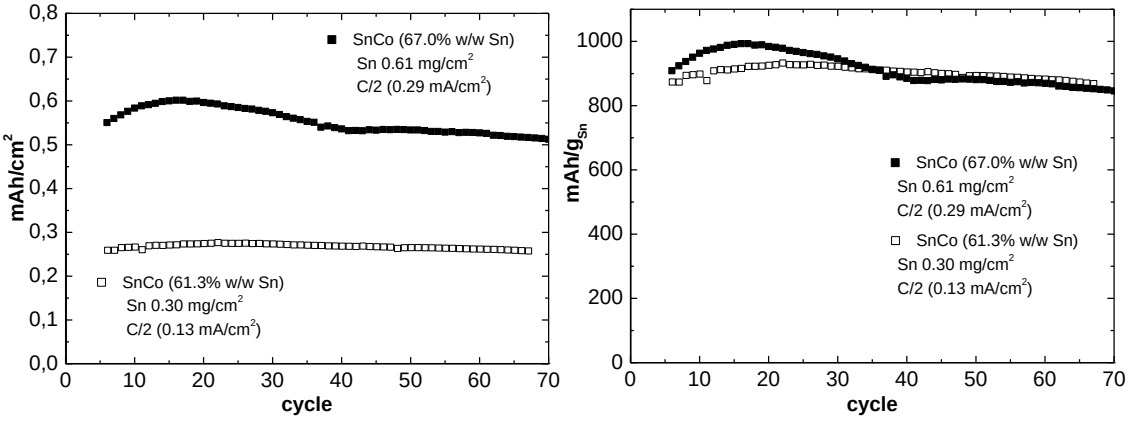
Corresponding author: Germano Ferrara (germano.ferrara@sunny-car.net)
Phone Number +3909123863732, Fax Number +3909123860841

It is well known that tin could be a suitable material for a high energy density anode in lithium-ion batteries, owing to its theoretical capacity (994 mAh/g). Unfortunately, like other elements alloying with lithium (Si, Sb, Al, etc.), tin suffers high swelling and relaxing processes during charge and discharge of the battery, respectively. Volume expansion up to 260 % can be observed, and this induces stresses whitin metal up to its crumbling which brings battery going off even after few cycles only.

In the present work it is demonstrated that electrodeposition inside pores of a nanostructured membrane can be a suitable path to fabricate an array of nanowires made of tin amorphous binary alloy with increased electrochemical performances both in term of high C-rate and capacity compared to those of carbonaceous anodes.

The right choice of the inert component to alloy with tin allows relaxing stresses induced by strain. Changing electrolytic bath composition it is possible to control alloy composition and crystalline structures, reaching the right compromise between a higher specific capacity (due to tin content) and a higher duration of performance (also due to the amorphous structure of the sample). Moreover, the particular shape of nanowires addresses strain mainly lengthwise, avoiding tin agglomeration.

Electrochemical characterization has been performed galvanostatically in a three electrode cell, with lithium both as counter and reference, by deep charge and discharge in the potential range from 0.020 to 2.000 V vs. Li^+/Li, at different C-rate in dimethyl carbonate:ethylene carbonate 1:1 – 1 M $LiPF_6$, at 30 °C. Figures below show the delivered capacity (mAh/cm^2 and mAh/g_{Sn}) of nanostructured SnCo alloy electrodes over cycling at C/2.



Honourary Scientific Committee:

Arnaldo Visitin
Jaromír Kadlec
Petr Vanýsek
Bruno Scrosati
Oumaru Savadogo
Doron Aurbach
Stefan Koller
Doron Aurbach
Vito di Noto
Jiří Kazelle
Jiří Vondrák
Marie Sedlaříková

Organisation Committee:

Jiří Vondrák
Marie Sedlaříková
Vítězslav Novák
Jiří Wagner
Josef Máca
Miroslav Zatloukal
Kristýna Jandová

Program Committee:

Jiří Vondrák
Marie Sedlaříková
Arnaldo Visitin
Germano Ferrara
Vítězslav Novák
Petr Bača
Jiří Špinka
Helena Polsterová
Zdenka Rozsívalová
Edita Hejátková
Miroslav Zatloukal

ISBN 978-80-214-4310-5