Low cost transportable device for transference of atmosphere sensitive materials from glove box to SEM

Bentzen, Janet Jonna; Saxild, Finn B.

Publication date:
2013

Citation (APA):
Low cost transportable device for transference of atmosphere sensitive materials from glove box to SEM

Janet J. Bentzen\(^1\) and Finn B. Saxild\(^2\)

\(^1\)Department of Energy Conversion and Storage, and \(^2\)Department of Physics, Technical University of Denmark – Risø Campus

Introduction

Moisture or air sensitive materials are often encountered within several highly important fields such as catalyst R&D, pharmaceutical R&D, and battery R&D. Essential to all materials research and development is microstructure characterization, which often implies electron microscopy. Entering the field of high energy battery research involving highly reactive metals, e.g. lithium, we needed a means of transferring atmosphere sensitive materials from the protective atmosphere of a glove box, avoiding air exposure, to a sample chamber of a scanning electron microscope. Thus, we constructed a low cost transportable device. The transportable transfer device holding a small evacuable chamber was constructed from a valve fitted with adapters to a glove box and a scanning electron microscope (JEOL 840). Examples of the application to high energy battery research are illustrated.

Study of pure lithium

A piece of pure lithium stored under Ar in a glove box, scraped on part of the surface to ensure the existence of a fresh metal surface was transferred to the SEM applying the transportable transference device.

Study of LiBH\(_4\)-Li solid solutions as crystalline electrolyte for all-solid-state lithium based batteries (Ref 1)

Above Li surface after 70 h exposure to air

Above Li surface after 70 h exposure to air

Li surface after exposure to air for “1 year

Argon stored Li surface

Scraped Li surface

The average particle and agglomerate sizes are larger in the annealed sample than in the unannealed sample.

Li → ion solid electrolyte

1/2 LiBH\(_4\) + 1/2 LiI

LiI solid solution

Acknowledgements: The authors like to thank Jørgen Lindbo, retired employee of Risø National Laboratory, for inspiring talks on the design of the transference device, and Johannes Steen Bang and Marc Overgaard for technical assistance.

Reference


* Corresponding author: Janet J. Bentzen, jabe@dtu.dk