



## Materials for Energy Storage and Conversion (Fuel Cells, Batteries)

Fachgebiet  
Strukturforschung

Fachbereich 11  
Material- u.  
Geowissenschaften

**Hartmut Fuess**

**University of Technology Darmstadt, Germany**

Prof. Dr. Dr. h.c.  
Hartmut Fuess

So-called sustainable energies are frequently presented as the future of mankind. Despite considerable research the contribution to the overall energy supply is marginal. The basic principles of their functioning have been demonstrated but many details for a wide-spread daily application are still under discussion.

Petersenstr. 23  
64287 Darmstadt

Tel. +49 6151 16 - 22 98  
Fax +49 6151 16 - 60 23  
hfuess@tu-darmstadt.de

21.05.2009

Batteries based on lithium containing materials are used for applications in portable instruments like laptop or mobile phones but not widely in cars. The research is concentrated on the new materials for cathode and anode as well as on mechanism for degradation. Structural changes are followed by x-ray diffraction in operando. Furthermore neutron scattering on complete cells elucidate the cation distribution in  $\text{LiMO}_2$  (M=Fe, Co, Ni, Mn) whereas neutron tomography reveals the distribution of lithium in a commercial battery.

Polymer electrolyte membranes (PEMFC) are working in the temperature range  $80^\circ\text{C}$ - $130^\circ\text{C}$ . The material for the cathode is a platinum alloy (RtRu) and pure Pt at the anode. The structure of a complete membrane electrode assembly (MEA) is under study by transmission electron microscopy. The structural changes under operation conditions are followed by x-ray absorptions (XAS). The fuel in this type of cells may be pure hydrogen or methanol as hydrogen carrier. The problem of hydrogen storage, however, is far from being solved. Neutrons are the ideal probe to locate hydrogen. Therefore an extensive program on hydrogen storage materials on our powder diffraction beam-line SPODI at the neutron research reactor FRM II has been launched.