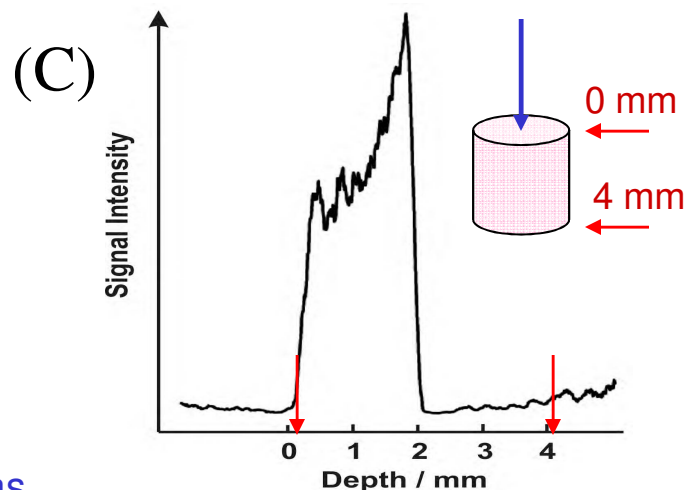
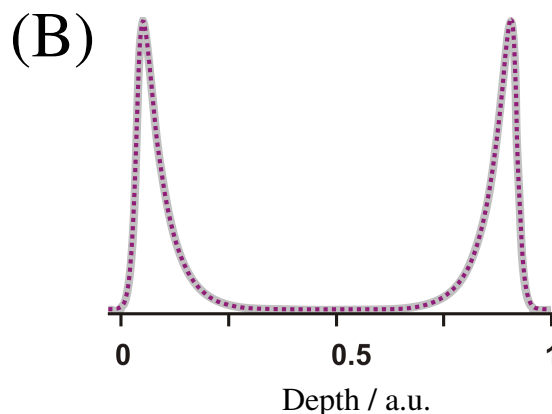
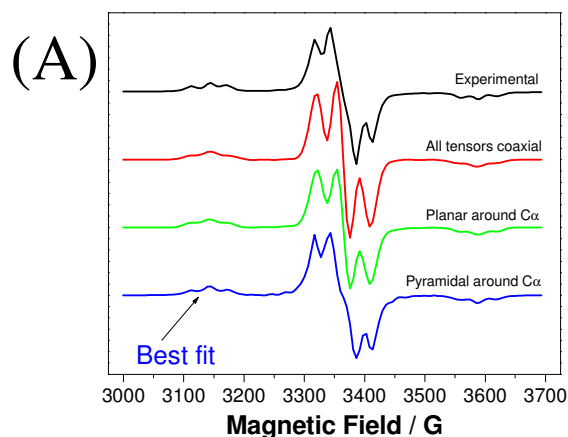


Morphological and Spatial Aspects in Polymer Degradation: From Heterophasic Polymers to Proton Exchange Membranes Used in Fuel Cells

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The structure of radical $\text{RCF}_2\text{CF}_2\cdot$ in Nafion exposed to the photo-Fenton reagent was deduced by fitting the ESR spectrum, with starting magnetic parameters from density functional theory (DFT). The combination of fitting and DFT is important for **elucidating the mechanism of Nafion membrane degradation in fuel cells.**

The **genetic algorithm (GA)** was implemented in order to determine 1D concentration profiles from ESRI images. The GA was evaluated and performed better compared with the Monte Carlo approach. Above: Comparison of original (solid line) and fitted (dotted line) profiles for a bimodal concentration profile.

Application of ESR imaging to dosimetry: 1D ESRI profile for a $\text{K}_2\text{S}_2\text{O}_6$ cylinder 4 mm in length and in diameter, irradiated on one side to 190 Gy with N^{7+} is shown above. ESRI detected the limited spatial penetration of the radiation, which is an advantage **in cancer treatment.**

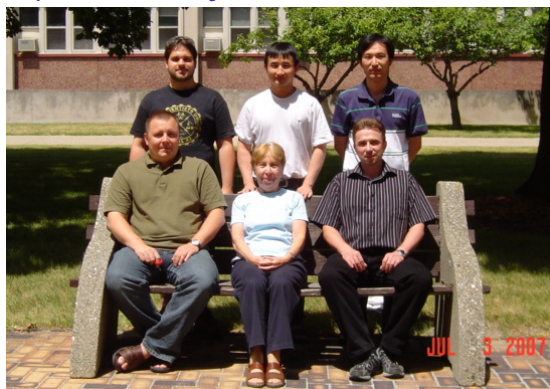
A. Lund, A.; Macomber, L.; Danilczuk, M.; Stevens, J.; Schlick, S. *J. Phys. Chem. B.* **2007**, on Web 07/24/2007.

B. Spalek, T.; Kruczala, K.; Sojka, Z.; Schlick, S. *J. Magn. Reson.* **2007**, in press.

C. Gustafsson, H.; Lund, E.; Schlick, S., presented by E. Lund at the ESR Meeting in Sofia, Bulgaria, June 2007.

Education and Outreach

- **The Group:** undergraduate student A. J. Perkowski (REU), postdoctorals M. Danilczuk, Q. Mao, and J. Ma, visiting scientists A. Lund and H. Gustafsson (Linköping University, Sweden), and K. Kruczala (University of Krakow, Poland).



- The proposal entitled “**MEMBRANES AND MEA’S FOR DRY, HOT OPERATING CONDITIONS**”, submitted by 3M, Case Western Reserve University, Colorado School of Mines, University of Detroit Mercy, and University of Alabama has been funded by DOE. The focus of PI Schlick’s contribution is **development of methods for the stabilization of membranes used in fuel cells**; funding was awarded for four years starting on 1 June 2007. The entire group met on 21-22 June in St. Paul, Minnesota to coordinate the collaborative effort.
- PI Schlick has edited a book entitled “**Advanced ESR Methods in Polymer Research**”, which was published in September 2006 by Wiley Interscience. In it she has contributed four chapters.
- **The Maria Sklodowska-Curie Medal for 2007** of the Polish Radiation Research Society has been awarded to PI Schlick, “in appreciation of her achievements in the field of radiation chemistry and photochemistry and her collaboration with Polish scientists”. The Society has invited the PI to Poland this September for an award ceremony and a lecture on her research.