

Conducting Polymers, Polyelectrolytes and Ultrathin Polymer Films in Mainz (FRG)

At the beginning of 1987, two inter-Nordic projects covering the areas of "molecular electronics" and "conductive polymers" were created and found support by the Nordic Fund for Industrial and Technological Development under the guidance of the Royal Swedish Academy of Engineering Sciences. One of the projects relates to the development of ultrathin organic films for use in electronics and biotechnology while the other involves the production and application of processable conductive polymers. The considerable overlap of these research topics with the current activities at the Max-Planck-Institut für Polymerforschung in Mainz, FRG, stimulated the convening of a one-day symposium held on 21 February 1988 in Mainz.

The symposium served as a platform for the exchange of information between all groups of scientists involved in the projects, i.e. both from the four Nordic countries Denmark, Finland, Norway and Sweden and from the Max Planck Institute, on the state of the art of research in these novel polymer systems including aspects of application in microelectronics, sensor technology and design of devices.

In the opening lecture *J. Böler* (Stockholm) presented an overview of the projects, pointing out that research on conducting ultrathin polymer films is being carried out at the University of Copenhagen (Denmark), Norsk Hydro (Porsbrunn, Norway), Center for Industriforsikring (Oslo, Norway), KSV Chemicals (Helsingfors, Finland), and the Royal Institute of Technology (Stockholm, Sweden). Processable conducting polymers are being studied at Linköping Technical University (Linköping, Sweden), Neste (Kullo, Finland), the Technical Research Center (Helsingfors, Finland), and Chalmers University of Technology (Gothenburg, Sweden).

J. Rühle (Mainz) then discussed hopping conduction in poly(3,4-cycloalkylpyrrole) perchlorates and presented new results on poly(3-alkylpyrroles). *H. Stubb* (Helsinki) described investigations on high-energy ion implantation in polythiophene films and polymer composites containing poly(octylthiophene). The following two lectures dealt with model compounds for conducting polymers. *V. Enkelmann* (Mainz) discussed X-ray structural analysis data of radical cation salts of aromatic hydrocarbons, especially salts of oligophenylenes, which serve as models for poly(*p*-phenylene), while *H. Hjertberg* (Gothenburg) presented

some results obtained in synthetic and NMR studies on aniline oligomers.

O. Wennerström (Gothenburg) lectured about NMR studies on conjugated macrocyclophanes and band structure calculations of linear conjugated polymers. *W. Meyer* (Mainz) reviewed the properties of solid polymer electrolytes which might find application in batteries. He concentrated on the properties of ionenes having a constant ion density. The dielectric properties of these polymers were described by *F. Kremer* (Mainz). From the relaxation behavior in an electric field, information is obtained about the transport of charge carriers in these materials. *T. A. Ezquerro* (Mainz) talked about the percolative behavior of spherical poly(pyrrole) particles with a monodisperse distribution in an poly(ethylene oxide) matrix as an example for an insulator-conductor composite. He explained the dc and ac conductivity in such composites in terms of a hopping theory using the random resistor network model of *Miller* and *Abrahams*. Substituted poly(thiophenes) were the subject of two other lectures. *J. Laako* (Kullo) focused on processable conducting polymer blends from poly(alkylthiophenes), which have potential application as shielding materials, and *G. Inganäs* (Linköping) discussed thermochromic effects in these polymers.

The session on ultrathin films began with a lecture by *C. Bubeck* (Mainz) who reviewed briefly the production of ultrathin layers of polymers by the Langmuir-Blodgett (LB) technique. He presented results on LB films consisting of relatively stiff macromolecules like poly(phthalocyaninosiloxanes) and poly(glutamates). *J. Virtanen* (Helsingfors) and *K. J. Jens* (Oslo) presented results on LB multilayers of conducting compounds, and *J. Raabe* (Mainz) described the determination of structural parameters in ultrathin polymer films by tunneling electron microscopy. The symposium ended with a lecture by *B. Krische* (Stockholm) on oligothiophenes.

In their closing remarks *J. Böler* and *G. Wegner* emphasized the importance of joint research efforts and continuous exchange of information in these novel fields of research which have great future potential in device technology.

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