

Scientific session of the Division of General Physics and Astronomy and the Division of Nuclear Physics of the Academy of Sciences of the USSR (25–26 March 1987)

Usp. Fiz. Nauk **153**, 353–354 (October 1987)

A joint scientific session of the Division of General Physics and Astronomy and the Division of Nuclear Physics of the USSR Academy of Sciences was held on March 25 and 26, 1987 at the S. I. Vavilov Institute of Physics Problems of the USSR Academy of Sciences. The following reports were presented at the session.

March 25

1. *S. A. Brazovskii*. Solitons in polymers: theory and experiment.

2. *G. V. Leplyanin and A. N. Chuvpyrov*. Study of quasi-one-dimensional compounds based on crystalline polyacetylene.

3. *M. L. Khidekel*¹. Problems of production and applications of high-conductivity polymers.

March 26

4. *A. I. Golovashkin*. High-temperature superconductivity (review of experimental data).

5. *V. L. Ginzburg and D. A. Kirzhnits*. High-temperature superconductivity (review of theory).

A summary of one of the reports is presented below. The texts of the reports presented on March 26 were published in the August issue of *Uspekhi Fizicheskikh Nauk* (**152**, 533 and 575 (1987)). [*Sov. Phys. Usp.* **30**, No. 8 (1987)].

M. L. Khidekel. *Problems of production and application of conductivity polymers*. In recent years great interest has been shown in high-molecular compounds exhibiting the properties of metals. This is attributable primarily to the fact that combining electrical properties with the familiar properties of polymers (corrosion resistance, workability) opens up fundamentally new possibilities for solving a number of important problems: development of new types of cables for transmitting electricity, development of electrically heated coatings for walls, development of new materials for removing electrostatic electricity and shielding from electromagnetic noise. The capability of high-conductivity polymers to undergo oxidation-reduction transformations under exposure to electric current suggests that it is possible to develop electrochromic devices and chemical sources of current.

In the report, which is based on published data, some problems of production and application of high-conductivity polymers are discussed.

It is shown that based on the semiempirical principles developed by the author of the report (the existence of a highly developed system of conjugate bonds, its transfer into a state of partial oxidation with the formation of complexes

with charge transfer, creation of a spatially close packing along the directions of charge transfer) it is possible to synthesize a wide range of high-conductivity polymer compounds.

The possible limits on the conductivity and methods for raising it from the existing values (10^2 – 10^3 Ω/cm) up to values characteristic for well conducting metals (10^6 Ω/cm) were discussed.

Approaches to the production of composite materials based on high-conductivity polymers in order to improve their stability and mechanical properties were analyzed.

It was shown based on published data that electrostatic coatings, coatings which provide shielding from radiation and electromagnetic noise, components for radioelectronic equipment (diodes, transistors, controllable thermistors), electrochromic devices, and chemical current sources can already be produced.

¹*Electronic Properties of Polymers and Related Compounds, Proceedings of International Winter School*. Kirschberg, Tirol, Austria, February 23–March 1, 1985, edited by H. Kuzmany, M. Mehring, and S. Roth, Springer-Verlag (Proceedings Series), New York (1985).

²C. E. D. Chidsey and R. W. Murray, *Science* **231**, 25 (1986).