CHEMICAL EFFECTS OF NUCLEAR TRANSFORMATIONS SYMPOSIUM IN PRAGUE

Having in mind that many countries are now operating, or will soon operate, small research reactors which, in addition to their other functions, can act as sources of radiation for the study of nuclear transformations, the International Atomic Energy Agency recently organized an international Symposium on Chemical Effects of Nuclear Transformations.

The Symposium was held in Prague, Czechoslovakia, from 24 to 27 October 1960, and was attended by 180 scientists from 25 countries and two international organizations.

Nuclear transformations are reactions in which the composition or energy states of nuclei are changed. Neutron capture, isomeric transition, alpha, beta, or gamma emission are important forms of such transformations. Much energy is usually released in a nuclear transformation, frequently destroying the molecule in which the reacting atom is bound. The term "hot atom effect" is often employed in referring to the high energy of the reacting atoms, and the whole subject has sometimes been called "hot atom chemistry".

Participants in the Symposium presented and discussed some 85 papers. The subject groupings included theoretical aspects of hot atom chemistry, gas-phase studies of recoil products, chemical effects of radiative neutron capture in organic liquids and alkyl halides, chemical effects of nuclear transformations in solids, carbon and tritium recoil chemistry, results of beta-decay (n, p), (d, n) and other reactions, and applied hot atom chemistry.

The following eminent scientists were Chairmen at the seven sessions of the Symposium: R. Brdicka (Czechoslovakia), J. I. Vargas (Brazil), J. E. Willard (USA), Mrs. K. E. Siekierska (Poland), B. M. Shukla (India), G. Harbottle (USA), N. Saito (Japan), W. Herr (Federal Republic of Germany), F. Cacace (Italy), A. P. Wolf (USA), G. N. Walton (UK), V. Nefedov (USSR), R. Leveque (France), and A. N. Nesmeyanov (USSR).

Professor A. G. Maddock (UK) and Dr. O. Suschny (International Atomic Energy Agency) were Scientific Secretaries at the Symposium.

The Symposium showed that interest in the subject matter is far from being exclusively academic. Though a large number of the papers dealt with theoretical aspects, it was felt that hot atom reactions provided a valuable means by which a large number of radioactive isotopes and labeled compounds could be prepared practically free from their inactive counterparts. Such so-called carrier-free preparations are in great demand for industrial, medical and scientific applications.

On the podium at the opening session of IAEA's Conference in Prague on Chemical Effects of Nuclear Transformations, left to right: W. Lisowski, IAEA Executive Secretary; A. Rylov, Deputy Director General, IAEA; V. Ouzky, Chairman, Czechoslovak Atomic Energy Commission; H. Seligman, Deputy Director General, IAEA; K. Petrzelka, Permanent Representative of Czechoslovakia to IAEA; A. Maddock, UK, Chief Scientific Secretary and O. Suschny, IAEA, Scientific Secretary

Discussions showed that a detailed knowledge of the characteristics of radiation damage was essential to the successful development of nuclear power. Nuclear transformations in solids provide a method of generating such damage and at the same time leave radioactive products that permit the study of the subsequent repair. This technique permits studies at levels of damage much below those that are necessary with the less sensitive purely physical procedures.

A number of papers emphasized the theoretical importance of the insight which hot atom chemistry gives into the mechanism of reactions occurring at abnormal temperatures.

Applications of hot atom chemistry in aiding understanding of fundamental physical and chemical processes and in elucidating radioactive damage effects were discussed. It was pointed out that one of the most important applications of "hot atoms" is in labeling compounds with radioactive atoms, and that this application had been greatly enhanced by the recent availability of gas chromotography for resolving the complex mixtures of products formed by recoil processes. Many participants were of the opinion that though the practical applications of hot atom chemistry were just beginning to reveal themselves, it would find wider use in the preparation of radioisotopes of very high specific activities and in the synthesis of compounds containing H^3 and C^{14}.