(determined by reaction with H_3O^+). Some machines and techniques have now been developed that allow observation on a nanosecond time scale, and the time resolution is likely to be improved in the near future. This will allow observation of intermediates such as ions in nonpolar liquids and excited singlet states, and the study of details of geminate recombination and reactions in "spurs" and particle tracks. A paper by Cooper and Thomas of the Argonne National Laboratory (where much of the pioneering work on pulse radiolysis has been done) describes the observation of CCl_4^+ with $t_{1/2}$ = 15 nsec in the pulse radiolysis of pure CCl_4. Pulse radiolysis has been applied to the study of a wide variety of systems including ice and frozen solutions, aqueous solutions of inorganic solutes, organic solutes, and macromolecules of biological significance, liquid ammonia, gases, and monomers and polymers.

One of the important discoveries in radiation chemistry in recent years was the hydrated electron. Following the measurement of its absorption spectrum by Hart and Boag in 1962, hundreds of rate constants for reactions with many types of substrates have been measured. Several studies, both theoretical and experimental, of its structure and thermodynamic properties have been made (the details of its formation and binding are still not completely understood, however). Studies of the hydrated electron have also stimulated further interest in solvated electrons and trapped electrons in other media. An ACS symposium on the Solvated Electron was held in 1965 and published as Vol. 50 of this series. Some advances since then are included in a number of papers in the present two volumes. These include a summary of the properties of the hydrated electron and a discussion of its importance in chemistry, particularly its identification with the species formerly referred to as "nascent" hydrogen, determination of its thermodynamic properties, its formation and trapping in pure ice and frozen aqueous and alcoholic solutions, and its reactivity with numerous inorganic and organic molecules. The measurement of many rate constants for reaction of e^-_{aq} have allowed attempts to correlate reactivity with structure of the substrate.

The papers on condensed organic systems display a variety of approaches used to identify the intermediates and follow their reactions. Much progress has been made recently in the study of ionic intermediates. Papers in this section deal with theory of ion formation and neutralization, with experimental study by ultrafast luminescence techniques, pulse radiolysis, scavenging techniques, the use of optical, esr, conductance and luminescence measurements to study irradiated organic glasses and polymers, and the injection of organic ions into liquids and solids. N_2O has been a useful scavenger for solvated electrons, N_2 being an ultimate product. In concentrations greater than that required for scavenging ($\sim 10^{-3}$ *M*), higher N_2 yields are observed (in cyclohexane, e.g.), and comparison with photochemistry suggests that excitation energy can also be transferred to N_2O. Other papers deal with the detection of triplet excited states (benzene, e.g.) by chemical means, the use of D substitution (hexane) to establish mechanisms of H_2 formation, the study of radical-radical reactions by irradiation at extremely high dose rate [10^{28} eV/(g sec)] now possible with field emission pulsed electron accelerators.

There are a number of papers on the use of conventional scavenging techniques to study liquid water, organic liquids, and some important gases such as H_2O, NH_3, and CO_2. Two interesting papers describe the esr study of radicals condensed from organic vapors irradiated with high energy electrons, and NH_3 irradiated with electrons at known energies in the range from 5 to a few hundred eV. Use of the microwave technique to follow electron decay in pulse irradiated gases is discussed in another paper. There are a few papers on reactions in the mass spectrometer.

The development of theory in this field has been slow. Theoretical papers in these two volumes are concerned with the structure of heavy particle tracks in water, the physical stage of radiolysis, ion neutralization in dielectric liquids, and collisional excitation transfer.

The radiobiologist should be interested in many of the papers, especially those in Vol. I dealing with molecules such as amino acids, peptides, proteins, nucleic acids, other macromolecules and polymers, and, of course, water.

A number of papers present mostly review material on selected topics such as electron stabilization in polar systems at low temperature, the reactivity of hydrated electrons toward inorganic compounds, the importance of hydrated electrons in various aspects of chemistry, electron scavenging in hydrocarbons, pulse radiolysis studies of aromatic molecules in solution, pulse radiolysis of monomers and polymers, radiation damage in inorganic solids studied by esr, radiation-chemical synthetic reactions with alkyl halides, and a critical review of measurements of radical yields in water.

While this collection of conference papers does not provide a concise overall review of the field, it does reflect the current status of the field and samples the research activity throughout the world.

These two volumes will be valuable not only to the radiation chemist but also to the reactor chemist and reactor engineer, the radiobiologist, and to the chemist generally who is concerned with mechanistics of reactions.

Edwin J. Hart, the conference chairman, and his colleagues at the Argonne National Laboratory are to be congratulated for sponsoring this interesting conference, and promoting the speedy publication of the papers.

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Fabrication of Thorium Fuel Elements. By L. R. Weissert and G. Schileo. American Nuclear Society (1968). 204 pp. $10.00.

This monograph, one of a series on *Metallurgy in Nuclear Technology* prepared under the auspices of the American Society for Metals in cooperation with the Division of Technical Information of the U.S. Atomic Energy Commission, is a well written primer on technology of fabricating reactor fuel elements containing the fertile material thorium. The subject matter of this 200-page monograph is covered in ten chapters entitled, 1) Sources of Thorium, 2) Thorium in Power Reactors, 3) Thorium Fuel Properties, 4) Radioactivity of Thorium Based Fuels, 5) Alloy Fabrication, 6) Oxide Fabrication, 7) Carbide

Fabrication, 8) Refabrication of ^{233}U, 9) Fabrication Hazards and Control, and 10) Programs and Trends. This reviewer enjoyed reading the monograph and was quite impressed with the amount of detail that is presented, particularly in the chapter on the refabrication of ^{233}U. Since the economics of the Th-^{233}U cycle are intimately tied up in the recycle of ^{233}U, this detailed exposition of the Babcock & Wilcox Company's method of attack of this problem is both pertinent to the objectives of the book and is a useful source of information on the problems that must be considered in fabricating ^{233}U containing ^{232}U, the primary source of alpha and gamma activity.

The value of this monograph is that information which is scattered throughout the literature is collected in one place by authors who are aware of the information primarily because of personal contacts and because they have grown up with the field. These authors have made a worthwhile addition to the literature on the subject of thorium. This monograph in conjunction with the information which may become available if the chapters on thorium of the cancelled *Materials Handbook III* are published as DTIE reports should give material engineers a fairly complete background on present day thorium technology.

This reviewer feels that the monograph would be even more valuable if the authors had also been able to address themselves to a discussion of the effect of fabrication variables on the life of the fuels.

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