

# RADIATION CHEMISTRY

## GENERAL INTRODUCTION

BY T. S. DANTON

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The absorption by matter of electro-magnetic radiation in the wavelength range 2000-7000 Å is generally a simple process. The destruction of the energy quantum occurs in a single act involving the quantum and the absorbing molecule only, and is governed by well-recognized laws. The absorption is selective, the primary products of the absorption process can often be identified unambiguously, and are found to be of similar reactivity, and their rate of formation and spatial distribution can usually be specified with some exactness and certainty.

In these respects the primary photochemical act differs completely from the primary act in chemical reactions which are induced by the absorption of high energy quanta (say radiation  $\lambda < 50 \text{ Å}$ ) or by the slowing down of rapidly moving charged and uncharged particles of atomic and subatomic nature. The mechanism of energy transfer from the radiation or the particles is complex, selective and imperfectly understood; it is not possible to make anything more than very approximate and qualitative predictions as to the number, nature and initial and final distribution of the entities formed in the primary process. Moreover, in the most important reaction medium, namely water, reactions initiated by one of the particles of the primary act may be reversed by one of the others. Despite the fact that at the turn of the century the development of radiation chemistry was comparable with that of photochemistry, the present status of the former subject is similar to that of photochemistry 30 years ago. At the present time the most useful conclusions as to the primary act are still obtained by inference from the nature of the ultimate products. The last few years have seen a considerable strengthening of this nexus due primarily to a greater understanding of the chemistry of free radicals and unstable ions, and it now seems that species of this kind must be intermediary between reactants and products.

The main purpose of this Discussion, which is the first to be held on this subject by the Faraday Society, is therefore to appraise the present position, to attempt what synthesis is possible of the views of the physicists, chemists and biologists who, for varying reasons, have contributed ideas and methods to the subject, and to suggest future lines of development. In the first three papers, the authors summarize some of the current ideas concerning the physical processes involved in the formation of the primary products. The lacunae in our knowledge of the mechanism of energy loss by fast charged particles are emphasized by Professor Spiers. We are still ignorant of the  $W$  values (i.e. energy required for creation of one ion pair) for liquids, and of the relation of the ionization potentials of the isolated molecules, which gain energy by inelastic collisions with the impinging particle, to this quantity  $W$  and the empirical quantity, the mean excitation potential  $\bar{E}$  which is employed in the Bethe theory in its original and modified forms. Nevertheless we do know in qualitative terms how the mean ion density of commonly-used radiations varies with the energy, mass and atomic number of the fast particle. The conclusions reached here are still the foundations on which are erected all hypotheses concerning the dependence of the reaction product in both

# Radiation Chemistry An Introduction

**Yijin Wang**



## **Radiation Chemistry An Introduction:**

Radiation Chemistry A. J. Swallow, 1973      **An Introduction to Radiation Chemistry** John William Tranter Spinks, Robert James Woods, 1964      **Radiation Chemistry** A. J. Swallow, 1973      *An Introduction to Radiation Chemistry* Robert James Woods, 2000      **Radiation Chemistry** A. J. Swallow, 1973      **Introduction to Radiation Chemistry** Spinks, 1964-01-01      **Radiation Chemistry**, 1964      **Radiation Chemistry**, 1968      Introduction to Radiation Chemistry Igor' Viacheslavovich Vereshchinskiĭ, Aleksei Konstantinovich Pikaev, 1964      **Introduction to Radiation Chemistry** Snor Vereshchinskii, 1964      **Radiochemistry and Nuclear Chemistry - Volume I** Sandor Nagy, 2009-08-25

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**PHYSICAL METHODS, INSTRUMENTS AND MEASUREMENTS - Volume IV** Yuri Mikhailovich Tsipenyuk, 2009-04-15 Physical Methods Instruments and Measurements theme is a component of the Encyclopedia of Physical Sciences Engineering and Technology Resources which is part of the global Encyclopedia of Life Support Systems EOLSS an integrated compendium of twenty Encyclopedias The Theme provides a complete survey of the present status of our knowledge of modern physical instruments and measurements It is organized in the following main topics Measurements and Measurement Standards Sources of Particles and Radiation Detectors and Sensors Imaging and Characterizing Trace Element Analysis Technology of Physical Experiments Applications of Measurements and Instrumentation which are then expanded into multiple subtopics each as a chapter These four volumes are aimed at the following five major target audiences University and College Students Educators Professional Practitioners Research Personnel and Policy Analysts Managers and Decision Makers and NGOs

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offers in depth perspectives on phenomena of ionization and excitation induced by charged particle and photon interactions with matter in vivo and in vitro This reference probes concepts not only in radiation and photochemistry but also in radiation physics radiation biochemistry and radiatio

**Nuclear Chemistry** Walter J. Bladel,1949 [U.S. Environmental Protection Agency Library System Book Catalog Holdings as of July 1973](#) United States. Environmental Protection Agency. Library Systems Branch,1974

*Polymer Photophysics Photochemistry* James Guillet,1985 Introduction to photochemistry and photophysics Polymer structure and reactivity Diffusion and permeability in polymers Determination of scission and crosslinking in polymers Photoprocesses in solid polymer matrices Fluorescence Excimers and exciplexes Phosphorescence Energy transfer and migration in polymers Photochemistry of carbonyl containing polymers Photopolymerization Photocyclization Miscellaneous photoprocesses Photo and radiation chemistry of polymers

**The Chemistry of the Hydrazo, Azo and Azoxy Groups, Volume 2** Saul Patai,1997-12-29 The first volume of The Chemistry of the Hydrazo Azo and Azoxy Groups was published in 1975 in two parts and the present book is the second volume of this publication Since 1975 three supplementary volumes dealing with the chemistry of double bonded functional groups were also published in the Series and these volumes contain much material on the chemistry of azoxy compounds Several subjects were omitted from the original volume in 1975 These omissions have been corrected in the present volume which contains chapters on Detection identification and determination on NMR on ESR on PES on pharmacology and toxicology and also on safety and environmental factors

*The Scientific Basis of Tissue Transplantation* G. O. Phillips,2001 This important book contains in one volume various subjects including anatomy physiology microbiology radiation sciences biology of healing of allografts biomechanics of allografts and transplantation immunology It is intended for easy and comprehensive use by practitioners in the field of tissue banking and tissue transplantation It can also serve as a textbook for a course in tissue banking

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