

RADIATION CHEMISTRY

Graduate School in Physics and Chemistry

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- **FUNDAMENTALS OF RADIATION CHEMISTRY AND BASIC TERMS**

Types of ionizing radiation. Interaction of ionizing radiation with matter: γ and X-radiation and high-energy charged particles. Differences between photochemistry and radiation chemistry. Bethe and Heitler equation. Concepts of LET, nature of ionization clusters, radiation chemical yield (G). Dosimetry of ionizing radiation. Concepts of the absorbed dose and the exposure dose. Sources of ionizing radiation. Pulse radiolysis as the time-resolved experimental technique in radiation chemistry. Analytical detection methods coupled with pulse radiolysis. Experimental possibilities of pulse radiolysis: determination of the rate constants (k) of radicals, acid-base equilibria constants (K) of radicals, one-electron reduction potentials of radicals (E^0)

- **GAS RADIOLYSIS**

Specificity of gas radiolysis. Radiolysis of selected gas systems.

- **WATER RADIOLYSIS**

Specificity of water radiolysis. Radiolysis of water in the absence of oxygen. Timing diagram of water radiolysis. Primary products of water radiolysis. Intra-spur reactions. Basic properties and reactions of hydroxyl radicals (HO^\bullet), hydrogen atoms (H^\bullet) and hydrated electrons (e^-_{aq}). Radiolysis of water in the presence of oxygen. Basic properties and reactions of superoxide radical anion ($\text{O}_2^{\bullet-}$), and hydroperoxide radical (HO_2^\bullet). Radiolysis of water initiated by ionizing radiation with higher LET. Radiolysis of water at high temperatures and pressures. Selective inorganic radicals: spectral characteristics and properties, application in LRET studies in peptides and proteins.

- **ORGANIC RADICALS CENTERED ON CARBON, OXYGEN, NITROGEN AND SULFUR ATOMS.**

The concept of free radical. Reactions of C-centered radicals. Types and reactions of O-centered radicals, Types and reactions of N-centered radicals. Types and reactions of S-centered radicals. Selected radicals of biological relevance.

- **RADIOLYSIS OF SELECTED ORGANIC SOLVENTS**

Specificity of radiolysis of organic solvents. Radiolysis of alcohols, acetonitrile, acetone, hydrocarbons, and halogenated hydrocarbons. Generation of radical cations, radical anions and excited states.

- **RADIOLYSIS OF IONIC LIQUIDS**

Features that differ ionic liquids (IL) from conventional solvents. Initial events in radiolysis of IL.