Formation of Radicals by Radiolysis of Organic Solids. Part I. Comparative Yields of Radicals from Various Organic Compounds

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The radiation yields of radicals from perhydroaromatic and aromatic hydrocarbons (benzene, diphenyl, terphenyl, and their derivatives) were determined by the EPR method. The yields were measured from the initial straight line portions of the radical accumulation curves at temperatures of —170° to —110°. It was found that for perhydroaromatic and hydroaromatic hydrocarbons with no conjugated common bonds, the yields amount to several radicals per 100 electronvolts of consumed energy. For aromatic substances the yields are smaller by one to two radicals, the yield decreasing with increasing number of conjugated bonds. A scheme is proposed to correlate the differences in radiation stability of the molecules with their initial excitation levels.

Catalytic Activity of Organic Polymers. Part III. Principles of Catalysis Over Polymeric Chelates of Various Structures and Chemical Compositions

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The principles governing catalytic activity of polychelates were investigated. In each study-case, atomic composition of the organic moiety enveloping the metal was varied to determine the effect of this variable. It was found that catalytic activity of polychelates depends upon the metal within the chelate ring, the nature of the atoms attached to the metal, and upon the properties of organic radicals of each polymer. The corresponding monomeric analogues have no catalytic activity. No correlation was uncovered between electrical conductivity and catalytic activity.

Catalytic Activity of Organic Polymers. Part IV. Catalytic Activity of Polymeric Chelates in Decomposition of Hydrogen Peroxide

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An investigation was carried out to determine the principles governing catalytic decomposition of aqueous solutions of hydrogen peroxide over various polymeric chelates. Catalytic activity of the chelates depends upon nature of the metal in the polychelate ring. Copper polychelates were found to be the most active, whereas cobalt-, iron-, and nickel polychelates are less active. Zinc and cadmium polychelates have no catalytic activity.

The nature of the atoms of the organic moiety connected to the metal is another factor which determines catalytic activity of polychelates. The third factor affecting catalytic activity of polychelates is composition of the organic radicals which are not directly attached to the metal. The latter factor was found to cause a change of 3 to 4 magnitudes in catalytic activity of polychelates.

The study shows that the decomposition rate of the reaction is greatly affected by the pH of the solution. Apparently, the magnitude of this effect depends upon the extent of participation of the hydrogen peroxide dissociation products formed in catalytic decomposition of this substance.

Gas Adsorption in Presence of Surface Effects

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A study was made of a linear model for adsorption of gaseous atoms. The assumption made was that the exchange and the overlap integrals are small compared to the Coulomb terms. This assumption is substantiated by the existence of the surface energy levels. The effect of electron interaction on the energy of adsorption was also considered. With sparsely filled energy zones, the electron interaction effect is quite small but with nearly filled zones it is quite large.