

ONE-QUANTUM PROCESSES OF PHOTSENSITIZED DECOMPOSITION OF ORGANIC COMPOUNDS UNDER THE INFLUENCE OF SOLAR RADIATION

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It is known that the photochemical decompositions of organic compounds in a series of courses involve by using of sensitizers for this purpose as the luminescent concentrate (LC) that isolated from the catalytic cracking heavy gas oil (CCHG>400°C) was used in previous works. The presence of polycyclic aromatic hydrocarbons (PAH) in composition LC, which are characterized by the wide and intensive absorption bands, creates the favorable conditions in the visible and UV range of spectrum for the more efficient light absorption and the energy transmission in photochemical reactions. The process of decomposition of organic compound (aliphatic alcohols and liquid paraffins) by using of photosensitizer LC involves by well-known two-quantum mechanism with the forming of alkyl radicals and atomic hydrogen.

In this context by the methods of EPR and low-temperature photolysis was investigated photodecomposition of aliphatic alcohols and liquid paraffins sensitized asphaltenes and resins of pyrolysis heavy resin (PHR>400°C). By possessing high paramagnetism the resinous-asphaltene substances (RAS) easily undergo the exposure of solar radiation which under its influence occurs photochemical and photo-oxidation processes on free-radical mechanism. Unfortunately, the information in literature about these questions is very scanty, but it is known that the high-molecular compounds of petroleum in the composition of oil residues can be used as the inhibitors of radical processes, stabilizers in thermo- and photo-oxidation processes.

The presence of free radicals in RAS as well as formation during photo-irradiation of electron-excited states of the radicals may play a certain role in photochemical processes of considered systems. The important role of electron-excited states of the RAS radicals is also defined that these radicals in comparison with PAH have absorption spectra shifted to the long-wave range which in its turn, extends the range of spectral sensitivity. Therefore during photoexcitation of free radicals RAS (are usually inert, but stable) under the influence of photo-irradiation with long-wave optical radiation occurs their activation that promotes the destruction of investigated compounds on C-C and C-H bonds with the formation of alkyl radicals and atomic hydrogen on one-quantum mechanism:



Conducted EPR investigations show that the diamagnetic molecules RAS with heteroatomic fragments, as well as the electron-induced radicals which are characterized by high (near to unit) quanta yields, play a big role in radical processes photodecompositions of organic compounds.

The applying of RAS of PHR>400°C as the photosensitizers photodecompositions of organic compounds is of great importance, as it doesn't require special thorough cleaning, as in the case of LC, which complicates the process and reduces the economic indices. The ability of RAS to absorb in a wide spectrum range is also promising and from the view point of utilization of solar energy.