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Photo-oxidation of Isolated from the oil naphthen-paraffinic and aromatic hydrocarbons fractions under atmospheric conditions

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Abstract

Photooxidation of naphthenic-paraffinic (NP) and aromatic hydrocarbon (AH) fractions isolated from Surakhany (Azerbaijan) oil under atmospheric conditions has been investigated. The isolated fractions were characterized by UV, IR, and PMR spectroscopy before and after exposure to UV radiation. It is assumed that in the presence of aromatic hydrocarbons, naphthenic-paraffinic hydrocarbons are oxidized as a result of the photoinductive action of aromatic hydrocarbons through their own oxidation products. The oxidation products of AH under the action of UV radiation under atmospheric conditions can be formed by: a) the interaction of AH (donor) excited under the action of UV radiation with air oxygen (acceptor) with triplet states with the transition of the acceptor to an excited state with the formation of singlet oxygen 1O_2 and the return of the molecule donor to the ground state and b) the formation of superoxide anion radical O_2^- as a result of electron transfer from the photoexcited AC molecule to molecular oxygen. In the presence of water, O_2^- can be protonated to conjugate acid – HOO^* radicals, which can be disproportionated to form hydrogen peroxide H_2O_2 with further decomposition of hydrogen peroxide to form a hydroxyl radical OH^* . The reaction between AC and singlet oxygen passes through the stage of endoperoxide formation, which then transforms into quinone. There is also a side reaction of decomposition of endoperoxide with the formation of an AH molecule and singlet oxygen. Further, the formed singlet oxygen oxidizes unexcited AH molecules. A mixed mechanism of photooxidation induced by singlet oxygen and free radicals is not excluded.

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