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Amid derivatives of salicylic acid – effective inhibitors of UV initiated oxidation of organic substrates

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Abstract

The results of the research are presented kinetics of UV initiated oxidation model substrate (methyloleat) in the presence of individual amides: 2-hydroxybenzoic acid *N*-(4-hydroxyphenyl)amide (**I**); 2-hydroxy-3-tretbutyl-5-ethylbenzoic acid *N*-(4-hydroxy-3,5-di-tret-butylphenyl)amide (**II**); 2- hydroxybenzoic acid *N*-[3-(4-hydroxy-3,5-di-tret-butylphenyl)prop-1-yl]amide (**III**); 2-hydroxy-3-tretbutyl-5-ethylbenzoic acid *N*-[3-(4-hydroxy-3,5-di-tret-butylphenyl)prop-1-yl]amide (**IV**) in comparison with reference antioxidants – dibunol and α-tocopherol. It is shown that all amides of salicylic acid **I-IV** effectively inhibit the process UV initiated oxidation of methyloleat. It is studied a relationship between antioxidant properties of amides salicylic acid **I-IV** of UV initiated oxidation and features of their structure. It is established that introduction shielding ortho-*t*-butyl substituents and separation of aromatic fragments by three methylene groups leads to a significant increase of antioxidant activity. It is shown that amide **IV** in the concentration range $(0.5\text{-}2.0)\cdot10^{-4}$ Mol/L exceeds the efficiency of dibunol by 20%.

Testing the anti-radical activity of amides **I-IV** estimated by the chemiluminescence method from the constant rate of the reaction with peroxy radicals allowed to establish the range of changes in value $k_7 = 0.52 – 6.86\cdot10^4$, $mol^{-1}\cdot s^{-1}$. It is shown that screening of phenolic OH-groups tret-butyl substituents and reduction of conjugation of electron density in molecules by separating the residue of salicylic acid and phenol by methylene groups leads to a significant decrease in anti-radical activity of antioxidants. Thus, the largest value of k_7 was established for the amide **I**, which in its structure has two unsubstituted phenolic hydroxyls. The antiradical activity of the shielded analogue (amide **II**) is 4 times inferior. The mechanism of the inhibitory action of amides of salicylic acid was established, it includes: direct interaction of phenols with free radicals; destruction of hydroperoxides of lipids due to the amide fragment of the molecule; partial absorption of UV radiation, associated with the presence of a salicylic acid residue.

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