

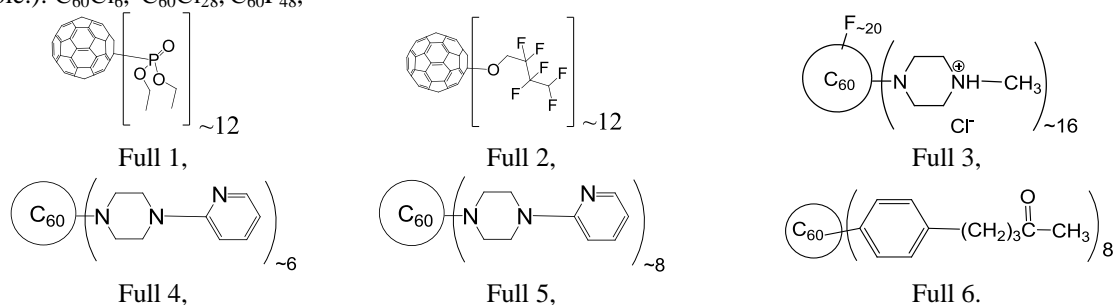
Peculiarities of the antioxidant action of exommodified fullerenes C₆₀ at the oxidation of organic compounds

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During for the last 10 years, we have studied the antioxidant properties of a large group of modified fullerenes based on C₆₀ [1, 2]. Directed synthesis of potential antioxidants (AO) carried out at the Institute of Chemical Physics (c. Chernogolovka). This paper presents the study results of antioxidant properties of fullerenes exommodified depending on the degree of functionalization, location and nature of functional groups in the carbon skeleton (Table.): C₆₀Cl₆, C₆₀Cl₂₈, C₆₀F₄₈,



Testing antioxidant polysubstituted derivatives of fullerene C₆₀ model was conducted in conditions of initiated oxidation of benzyl alcohol at 50 °C and 1 atm. The initiator of free radicals is 2,2'-azo-bis-izobutyronitryl.

Table The rate constants of the chain termination of oxidation benzyl alcohol by fullerenes (50 °C)

Formula	C ₆₀	C ₆₀ Cl ₆	C ₆₀ Cl ₂₈	C ₆₀ F ₄₈	Full 1	Full 2	Full 3	Full 4	Full 5	Full 6	Full 7
$k_{ROO\cdot}, 10^3, l/(mol \cdot s)$	0,143	0,446	0,547	0,13	21,5	11,7	15,6	0,61	2,78	1,0	6,35
$k_{R\cdot}, 10^7, l/(mol \cdot s)$	1,3	1,5	2,37	8,9	-	1,5	8,24	0,114	-	-	-
f	2	2	2	2	2	2	2	≥ 25	≥ 16	≥ 21	2

Conclusions

1. Exohalogenation of C₆₀ fullerene surface leads to a selective oxidation of the cliff by alkyl radicals (C₆₀ → C₆₀Cl₆ → C₆₀Cl₂₈ → C₆₀F₄₈).
2. Fluoridation frame C₆₀ retains its active interaction with alkyl radicals (C₆₀F₄₈ ↔ Full 2).
3. Modification nitrogen-containing heterocyclic substituents groups leads to repeated breakage radicals on substituents (gross stoichiometric $f > 16$ at 4 Full, Full 5, Full 6).
4. By increasing the branching of substituents (more than 5) exommodified fullerenes interact only with peroxy radicals (Full 1, Full 5, Full 6, Full 7).
5. When modifying fullerenes polyfluorinated substituents are growing activity of its interaction with peroxy radicals (Full 2).

We first determined that oxidation chains fullerenes held simultaneously with both peroxides and alkyl radicals. For the first time were estimated rate constants of oxidation chains breaking of organic compounds exommodified fullerenes. The realization of catalytic oxidation chains of benzyl alcohol exommodified nitrogen-containing fullerenes.

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