IMIDAZOLINE SPIN LABELS, PROBES, AND TRAPS FOR RESEARCH AND INDUSTRY

Description
Synthesis methods and production processes were designed for stable nitroxide radicals of the imidazoline series and their precursors, which are used as spin labels, probes, and traps in research and industry. The radicals in concentrations of ~10^{-10} molar percent are determined by electron spin resonance (ESR), and high-resolution ESR spectra allow identification of individual compounds.

Diagram of using tracer agents

The synthesis and production methods yield an extremely wide range of compounds. The purity of the compounds is 95-99 %.

Technical appraisal and economic benefits
The designed nitroxide radicals of the imidazoline series and their precursors are unique; foreign analogs are not available.
In contrast to the heterocyclic radicals of the piperidine and pyrroline series containing one nitrogen atom offered by foreign corporations, imidazoline derivatives are resistant to acids and oxidizers and the presence of the second nitrogen atom makes it possible to use them to synthesize a large number of chelating agents for analytical and supramolecular chemistries.
Since imidazoline radicals of natural occurrence are not known, the designed radicals can be used as tracers of reservoir fluid flow, concealed labels, etc.

Application areas
Imidazoline nitroxide radicals can be applied in various areas of science and engineering:
In medicine and biology:
• as spin pH probes to measure the pH value in bioplasts;
• to analyze ion-transfer processes through membranes;
• to determine the localization of drugs and other substances in organs or tissues.
In analytical chemistry and geophysics:
• to design chelating agents capable of binding to metals;
• as tracers with a low determination threshold (for example, instead of tritium or organic dyes in oil exploration and production, instead of fluoroaromatic acids in analysis of groundwater flow).
In other areas:
• as concealed labels (in fuels, alcohols, etc.)
Development stage
Production of nitroxide radicals of the imidazoline series was launched at the pilot factory of the Vorozhtsov Institute of Organic Chemistry, RAS. Batches of the precursors of the imidazoline radicals were produced and used to develop methods for controlling oil-reservoir flooding.

Patent situation
Patents were granted in the Russian Federation (1978 and 1988).

Commercial offers
Production and delivery contracts. Providing research and development services. Investment contracts for commercialization of the development (launching production). License agreements.

Estimated cost
The cost of delivery of the compounds and providing services is determined by their complexity and scope. The cost of licenses is to be negotiated.

Contacts
Cand. Sc. Dmitry G. Mazhukin, Scientific Secretary
Novosibirsk Institute of Organic Chemistry, Siberian Branch of the Russian Academy of Sciences
9, Prosp. Akademika Lavrentieva, Novosibirsk, 630090, Russia
Phone: (383) 330-78-60
Fax: (383) 330-97-52
E-mail: council@nioch.nsc.ru
http://www.nioch.nsc.ru