



Survey of Fertilizers and Related Materials for Perchlorate (ClO_4^-)

Final Report



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Notice

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Foreword

The U.S. Environmental Protection Agency is charged by Congress with protecting the nation's land, air, and water resources. Under a mandate of national environmental laws, the agency strives to formulate and implement actions leading to a compatible balance between human activities and the ability of natural systems to support and nurture life. To meet this mandate, EPA's research program is providing data and technical support for solving environmental problems today and building a science knowledge base necessary to manage our ecological resources wisely, understand how pollutants affect our health, and prevent or reduce environmental risks in the future.

The National Risk Management Research Laboratory is the agency's center for investigation of technological and management approaches for preventing and reducing risks from pollution that threatens human health and the environment. The focus of the laboratory's research program is on methods and their cost-effectiveness for prevention and control of pollution to air, land, water, and subsurface resources; protection of water quality in public water systems; remediation of contaminated sites, sediments and ground water; prevention and control of indoor air pollution; and restoration of ecosystems. NRMRL collaborates with both public and private sector partners to foster technologies that reduce the cost of compliance and to anticipate emerging problems. NRMRL's research provides solutions to environmental problems by developing and promoting technologies that protect and improve the environment; advancing scientific and engineering information to support regulatory and policy decisions; and providing the technical support and information transfer to ensure implementation of environmental regulations and strategies at the national, state, and community levels.

This publication has been produced as part of the laboratory's strategic long-term research plan. It is published and made available by EPA's Office of Research and Development to assist the user community and to link researchers with their clients.

E. Timothy Oppelt, Director
National Risk Management Research Laboratory

Abstract

The most comprehensive survey of fertilizers and other raw materials for perchlorate to date has been conducted to determine whether these could be significant contributors to environmental perchlorate contamination. The data span a large range of commercial products; however, they were collected over a relatively short time period and comprise a snapshot rather than addressing temporal patterns of perchlorate occurrence. This investigation was designed to account for the difficulties in chemical analysis presented by fertilizer matrices and the problems in obtaining representative samples of these materials. Emphasis was placed on sampling source materials (which also form the basis of most blends) to broaden the applicability of the results to production farming as well as consumer use. Field samples of 48 different products from manufacturers of major commodity chemicals were collected from representative sites around the nation. These covered major sources of macronutrients, some sources of micronutrients, and several sources of fillers/additives. Whenever possible, field samples were collected under supervision of state chemists or agriculture department staff. The field samples were riffled and divided; portions of each material were sent to several laboratories for analysis. Perchlorate was dissolved by leaching the material with deionized water with shaking. Subsequently, the aqueous leachates were subjected to ion chromatography using Dionex IonPac AG16 and AS16 columns. All materials were tested by at least four independent laboratories. Laboratories were required to demonstrate satisfactory recovery of fortifications and performance on 7 quality control samples; agreement on duplicate portions (not identified to the labs) of four materials was also required. Each laboratory had previously been subjected to a performance evaluation using test samples. Except for those products derived from Chilean caliche (a natural perchlorate source), the specific natures of the manufacturing processes suggest that perchlorate should not be present in most fertilizers. Chilean nitrate salts constitute about 0.14% of U.S. fertilizer application. Perchlorate was positively detected only in those materials known to be derived from Chilean caliche. The data obtained here fail to suggest that fertilizers contribute to environmental perchlorate contamination other than in the case of natural saltpeters or their derivatives. Limited discussion is included on the implications for agriculture and horticulture as well as factors that complicate investigations or data analysis and interpretation.

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