ISSN: 2582-4686 SJIF 2021-3.261,SJIF 2022-2.889,
2024-6.875 ResearchBib IF: 8.848 / 2024

THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

VOLUME-4, ISSUE-2

FLUORINATED PHOSPHATES

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Abstract:

This abstract provides a concise overview of the topic of fluorinated phosphates, exploring their synthesis, properties, and diverse applications across various fields. Fluorinated phosphates, characterized by the incorporation of fluorine atoms into phosphate compounds, have garnered significant interest due to their unique chemical and physical properties. This abstract summarizes key aspects of the research on fluorinated phosphates, shedding light on their synthesis methodologies, structural characteristics, and applications in areas such as materials science, catalysis, and medicinal chemistry. The study emphasizes the growing importance of fluorinated phosphates in advancing scientific and technological innovations.

Keywords: Fluorinated phosphates, Synthesis, Properties, Applications, Materials science, Catalysis, Medicinal chemistry, Fluorine-containing compounds, Phosphorus chemistry, Chemical synthesis.

Аннотация.

В этом реферате представлен краткий обзор темы фторированных фосфатов, исследуются их синтез, свойства и разнообразные применения в различных областях. Фторированные фосфаты, характеризующиеся включением атомов фтора в фосфатные соединения, вызвали значительный интерес благодаря своим уникальным химическим и физическим свойствам. В этом реферате обобщаются ключевые аспекты исследований фторированных фосфатов, проливаются свет на методологии их синтеза, структурные характеристики и применение в таких областях, как материаловедение, катализ и медицинская химия. В исследовании подчеркивается растущая важность фторированных фосфатов в продвижении научных и технологических инноваций.

Ключевые слова: фторфосфаты, синтез, свойства, применение, материаловедение, катализ, медицинская химия, фторсодержащие соединения, химия фосфора, химический синтез.

Introduction.

Fluorinated phosphates represent a distinctive class of compounds that have gained substantial attention in various scientific disciplines due to their intriguing properties and versatile applications. The incorporation of fluorine atoms into phosphate structures imparts unique characteristics, influencing reactivity, solubility, and other physicochemical properties. This introduction provides an overview of the significance of fluorinated phosphates, outlining their synthesis methodologies, properties, and the diverse array of applications across fields such as catalysis, materials science, and medicinal chemistry. As researchers explore new avenues in phosphorus chemistry, fluorinated phosphates emerge as promising candidates for advancing scientific understanding and technological innovation.

Methodology:

The synthesis and characterization of fluorinated phosphates involve a combination of traditional and innovative methodologies. Classical synthetic routes include the reaction of

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phosphorus-containing precursors with fluorinating agents, while modern techniques often employ advanced instrumentation such as NMR spectroscopy, X-ray crystallography, and mass spectrometry for detailed structural analysis. Additionally, computational methods play a crucial role in predicting the properties and behaviors of fluorinated phosphates. The methodology section outlines the specific procedures, analytical techniques, and computational approaches employed in the study of fluorinated phosphates, providing a foundation for the subsequent results and analyses.

Results:

The results section presents the outcomes of the research on fluorinated phosphates, encompassing synthesized compounds, structural elucidation, and any observed properties. This may include data on reaction yields, spectral analyses, and crystalline structures obtained through various characterization techniques. Results also highlight the versatility of fluorinated phosphates in different applications, showcasing their potential in catalysis, materials design, and medicinal chemistry.

Analyses:

Analyses of the results delve into the implications and significance of the synthesized fluorinated phosphates. This involves the interpretation of structural data, discussions on the influence of fluorine incorporation on properties such as acidity, basicity, and reactivity, and comparisons with non-fluorinated analogs. Computational analyses may further contribute insights into electronic structures and energetic properties. The section critically evaluates the obtained results in the context of existing literature, contributing to a comprehensive understanding of the impact of fluorinated phosphates in the studied applications.

Defluoridated phosphates, $HF+SiF_4$ of fluorine in the form of (contains a lot of HF which is) mixture gaseous to the phase the loss of with together take to go natural phosphates thermal again work the way through is taken. Thermal in decay phosphates water steam in the presence of relatively fast and full is defluorinated. Apatite at 1400-1550°C hydrothermal again works, initially, crystal on the fence of fluorine hydroxide group with to exchange:

$$Ca_5(PO_4)_3F + H_2O = Ca_5(PO_4)_3(OH) + HF$$

then and hydroxyapatite to decay:

$$2Ca_5(PO_4)_3(OH) = 2Ca_3(PO_4)_2 + 4CaO*P_2O_5 * H_2O$$

take will come.

Disintegration products in citric acid melting α - tricalcium phosphate and tricalcium phosphate consist of Tricalcium phosphate in two kinds - a and b in the modification there is will be their to each other rotation point is equal to 1180 ^{0}C. From this temperature below irreconcilable b - modification, above while flexible (lemon and with citrate soluble) amorphous a - modification will be stable. Amorphous of tricalcium phosphate a - form him fast by cooling save to stay can

Silica in the presence of a - of the form b - form grows temperature decreases and this growth speed is the same slows down, as a result, product - even factory liquefaction slowly even when cooled valuable properties are not lost.

The defluoridation process somewhat accelerates because the silica of apatite crystal structure break feature; in this the snow of silica to the amount depends otherwise, different in the content of calcium phosphate and of silicates hard solutions - silicophosphates harvest will be For example, hydroxyapatite in decay Silica :

$$2Ca_5(PO_4)_3(OH) + 0.5SiO_2 = 3Ca_3(PO_4)_2 + 0.5Ca_2SiO_4 + H_2O$$

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the reaction according to participation is enough of apatite silica in the presence of hydrothermal disintegration common in appearance as follows to express can :

$$2nCa_5(PO_4)_3F + mSiO_2 + nH_2O = 10nCaO \cdot ZnP_2O_5 \cdot mSiO_2 + 2nHF$$

of phosphates hydrothermal defluoridation rotary in drums, cyclone, converter and another in ovens done increase can Hydrogen with enriched fuel, eg natural gas or when fuel oil is used water steam special transfer is not required because burning in products enough amount (more than 14%) of water steam will be

Apatite concentrates and 20-25% (apatite to the mass relative to) from silica consist of cold at a relatively low temperature liquefied. So in the composition silica has been cold liquefaction method with defluoridated phosphates in getting is used. In burning and is significant level of liquid phase harvest from being rid of for in silica the amount increases or reduces need Frost in the USA common up to 50% of the mass silica is added, i.e one different in quantity phosphorite and sand mixed. In this received the product is in citric acid up to 20% soluble P_2O_5 holds

Cremation in MDX with phosphates hydrothermal defluoridation of a small amount of silica (sand). The addition of silicon-done is increased, but the defluorinated phosphorus acid with CaO P_2O_5 = 3 molar in proportion (phosphate 4-6% of the mass amount) is moistened and in the oven, pollination reduced for becomes granulated. Phosphate acid in the presence of of the process temperature up to 1380-1420 ^{0}C decreases . Above given defluoridation from the reaction In addition, the reaction also occurs will be This is a reaction common it looks like.

$$3Ca_5(PO_4)_3F + H_3PO_4 = 5Ca_3(PO_4)_2 + 3HF$$

Reagents from mixing, at first monocalcium phosphate harvest, will be, then of temperature rise as a result calcium meta- and to polyphosphates becomes and their between from exposure while tricalcium phosphate harvest will be Phosphate of acid the addition of defluoridation accelerates and P_2O_5 in the product the amount increases. Easy liquid phosphorites (for example, Karatog and Qizilkum phosphorite). Phosphate acid with moistening their liquefaction temperature increases. That's it phosphorites rotary in furnaces at a temperature of 1250 - 1300 ^{0}C to burn through defluoridation enable will give. Easy liquid phosphorites of defluoridation another method they are cyclonic or with a converter is liquefied in ovens at 1500-1600 ^{0}C.

Rotating in ovens defluorinated phosphates get processed the following apatite and returned dust Phosphate acid and water with mixing; Shikhtani granulation; grains to burn the product to grind ready the product cooling, covering and to the consumer juntas; from the oven coming out firehouse gases heat swallow in the cocoon cooling (steam production release); gases from dust cleaning; firehouse in gases fluorinated compounds separate get and they fluorinated to the products rotate from stages consists of Rotating of the oven diameter 3.6 m and length 100 m (ready product on this productivity: designed - 6 t/s; achieved - equal to 7.3 t/s).

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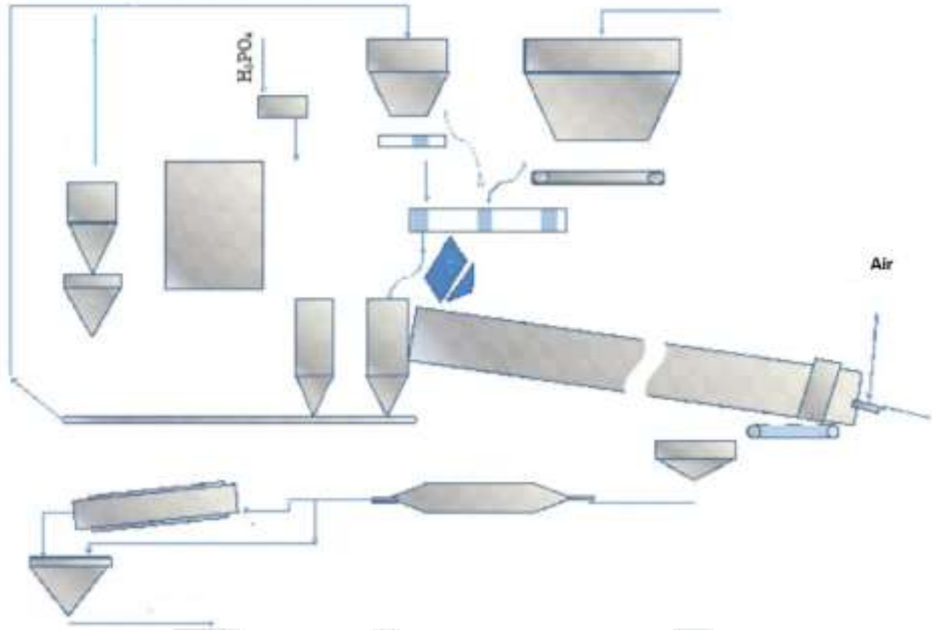

Picture 1 . Rotating in ovens defluorinated phosphates work release scheme

1 - apatite bunker for; 2 - weight measure soil conditioner; 3 - dust bunker for; 4- supplier; 5 - phosphorus acid moderator; 6 - two circuit mixer; 7 - saucer-shaped granulator; 8 - cyclone (dust holder); 9 - heat the winner boiler; 10 - dusty camera; 11 - rotary oven; 12 - recuperator; 13 - conveyor, 14 - klenker bunker for; 15 - oscillating supplier; 16 - mill; 17 - cooling the drum; 18 - ready product storage bunker.

Cyclonic to the cameras contains less than 28% non-soluble P 2 O 5, and -15 % insoluble the rest held raw material is given Insoluble of the remainder shown less than the norm or a lot to be raw material liquefaction temperature to the increase of this as a result while technology of the process to the violation take will come. Cyclones high in the part natural gas the air in the flow is burned. To the camera phosphorite flour loading 7 t/ c, natural gas spending and 3000-3200 m / c from aggregate get out temperature 1450-1480 °C, producing steam release and 20-30 t/ c organize is enough Current at the time technological of the system the work productivity increase for in aggregates natural the gas of air technical oxygen within the mixture is burned.

from ETA-cooled gases from dust cleaning one after another to the cyclone and the electrofilter is transmitted. Next in hardware cleaned from gases fluorinated compounds were taken.

Phosphate raw the item liquefaction method with defluorinated phosphates get processed each one 150 t/ day in productivity working energy technology through aggregate (ETA) s done is increased (picture 2).

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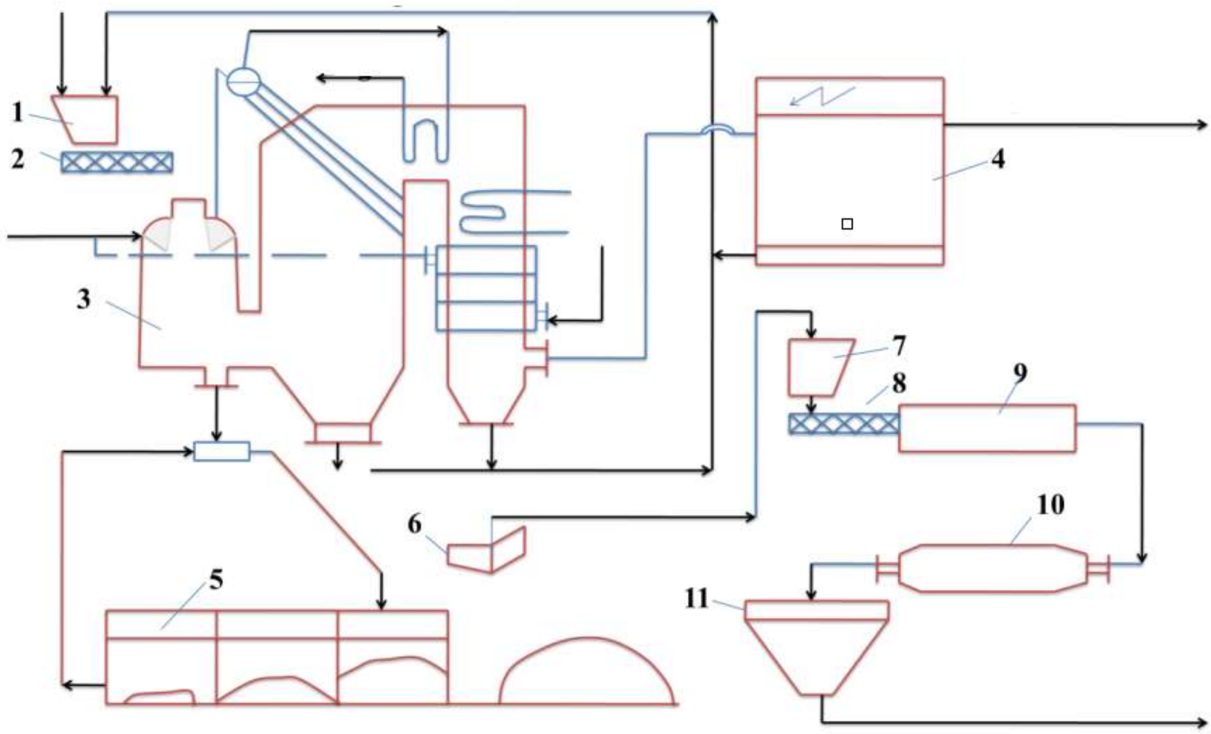

Picture 2. Cyclonic in the camera defluorinated phosphates work release scheme

1- hopper for phosphorite; 2- supplier; 3-energy-technological unit; 4-electrofilter; 5th silencer 3; 6 - grabber (bucket) transmitter; 7-defluorinated phosphate bunker for; 8 - supplier; 9 - drying the drum; 10 - mill; 11. Finished product storage bunker.

Cyclonic without mixing coming out liquefaction mul water in the flow. Liquefaction found as a result in the composition of a lot 0.4 % chloride in acid-soluble P_2O_5 held product is taken. Liquefaction to read as a result harvest has been grainy the product from water separation with a pacifier in pools done is increased. The product is dehydrated. The first stage from the material water in grab cranes by itself to the pool flowing fall through is separated. The second stage and the material is the drum in the dryer is dried. From this after the product spherical in the mills, it is crushed and paper into bags will be placed. Cyclonic oven high comparison has productivity - 2.5 t /(m *s), but to him fuel and energy spending very is high.

Marked State standards requirements according to, higher and the first-in-kind defluoridated nutritious phosphates work are issued. In the components, varieties suitable as P_2O_5 -, (0.4% li HCl at soluble) - from 41 and 28% less it's not; CaO - 34 and 30%; F - from 0.2% many p it's not; As - 0.0002 and 0.001%; P - 0.002 and 0.003%; H_2O will be 4 %. Particles size 1 mm from not to exceed it is necessary

Defluoridated phosphates are nutritious tools as they are used, however, their long lifetime effect doers good dogs use too high effect.

Discussion:

The discussion section contextualizes the findings within the broader scope of phosphorus chemistry and relevant scientific disciplines. It explores the potential mechanisms underlying observed behaviors, addresses any limitations or challenges encountered during the study, and elucidates how the results contribute to advancing knowledge in the field. The discussion also considers future directions for research on fluorinated phosphates, proposing avenues for further exploration and applications.

Conclusion:

In conclusion, the study of fluorinated phosphates presents a promising and dynamic field within phosphorus chemistry. Their unique properties, synthesis methodologies, and diverse applications make them compelling subjects for ongoing research. The collective insights gained from the methodology, results, analyses, and discussion contribute to a deeper understanding of fluorinated phosphates, setting the stage for continued exploration and innovation in this intriguing area of chemical research.

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