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EXTRACTION OF CERESIN FROM OZOKERITE

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Abstract

Ceresin, a naturally occurring wax, has various industrial applications, including in cosmetics, pharmaceuticals, and lubricants. It is primarily extracted from ozokerite, a naturally occurring hydrocarbon wax found in the earth's crust. This article explores the process of extracting ceresin from ozokerite, focusing on the methods of extraction, purification, and the uses of the extracted wax. Additionally, the economic and environmental implications of ceresin production are discussed, along with current challenges and potential improvements in the extraction process.

Introduction

Ceresin is a wax derived from ozokerite, a naturally occurring mineral wax that is primarily composed of hydrocarbons and is found in specific geological formations, especially in regions with large deposits of bitumen and petroleum. It has been used historically in various industries, including cosmetics, pharmaceuticals, and as a lubricant in industrial applications due to its unique properties, such as high melting points and stability at room temperature.

Ozokerite itself is a complex mixture of saturated hydrocarbons, paraffin, and microcrystalline waxes. Over time, ozokerite has been increasingly processed to extract valuable components, with ceresin being one of the most commercially important by-products.

This article provides an in-depth review of the methods of ceresin extraction from ozokerite, the properties of ceresin, its various applications, and the challenges involved in its extraction and purification.

Ozokerite and Ceresin: Overview

Ozokerite Composition

Ozokerite is a natural mineral wax found in deposits in various parts of the world, including Eastern Europe, North America, and Asia. It consists mostly of paraffinic hydrocarbons and smaller amounts of aromatic hydrocarbons, with a high concentration of saturated hydrocarbons.

The composition of ozokerite varies depending on the location of the deposit, but it generally contains around 40–60% paraffin wax, 20–30% microcrystalline wax, and other components, such as resins and oils.

Ceresin Composition

Ceresin is a purified form of ozokerite and is predominantly composed of paraffin waxes with minor amounts of other hydrocarbons. The removal of the impurities and other constituents from ozokerite gives ceresin its characteristic properties:

- High melting point (typically 75–85°C)

- Non-toxicity and odorlessness

- Water resistance and insulation properties

- Opacity and stability under various conditions

Due to these characteristics, ceresin finds wide usage in cosmetics, pharmaceuticals (such as in ointments and balms), candles, and lubricants.

Methods of Ceresin Extraction from Ozokerite

The process of extracting ceresin from ozokerite involves several steps, including mining, physical treatment, and chemical purification. Below are the main methods for extracting ceresin:

Mining and Preliminary Processing of Ozokerite

The first step in ceresin production is the extraction of ozokerite from the earth. This is typically done by mining ozokerite deposits, which are often located deep underground. The crude ozokerite is then transported to processing plants where it is subjected to preliminary treatment to remove large impurities, such as stones, soil, and larger hydrocarbon fractions.

Experimental part

Solvent Extraction Method

The solvent extraction method is one of the most common techniques used to isolate ceresin from ozokerite. This method takes advantage of the differing solubility of ceresin and other components in ozokerite. The general steps involved in the solvent extraction process are:

1. Crushing: The ozokerite is first crushed into smaller pieces to increase the surface area.

2. Solvent addition: A solvent, typically ligroin or petroleum ether, is added to the crushed ozokerite. These solvents selectively dissolve ceresin, leaving behind higher-molecular weight components, such as bitumen and resins.

3. Filtration: After dissolution, the mixture is filtered to remove insoluble impurities. The liquid phase contains the dissolved ceresin and other waxes.

4. Separation: The solvent is then evaporated under reduced pressure, leaving behind the purified ceresin.

5. Purification: The ceresin may undergo additional purification, such as washing with hot water, to remove any residual solvent or impurities.

This method is widely used due to its efficiency and high yield in obtaining pure ceresin.

Thermal Extraction

Thermal extraction involves heating ozokerite at elevated temperatures to separate its various components based on their different boiling points. The process typically includes the following steps:

1. Heating: The crude ozokerite is heated in a furnace or a distillation unit to around 250–300°C. This causes the wax components, including ceresin, to melt.

2. Distillation: The melted ozokerite is subjected to a distillation process where lighter waxes and hydrocarbons are separated from the heavier components.

3. Cooling and Solidification: After distillation, the ceresin is cooled and solidified into a wax-like form. The remaining components, including oils and resins, are separated and discarded.

Although this method can produce ceresin, it often requires additional steps, such as solvent washing, to purify the wax further.

Hydrogenation and Chemical Treatment

In some cases, hydrogenation is used to further refine ceresin obtained from ozokerite. This involves the addition of hydrogen to the extracted wax in the presence of a catalyst. The process helps to reduce the content of aromatic hydrocarbons, making ceresin more suitable for use in pharmaceuticals and cosmetics.

In addition to hydrogenation, ozokerite may also be treated with acidic or alkaline solutions to remove trace impurities and increase the wax's purity.

Applications of Ceresin

Ceresin has various applications across multiple industries due to its unique properties:

Cosmetics and Pharmaceuticals

Ceresin is commonly used in cosmetics and pharmaceuticals as a base for ointments, creams, and balms. Its emollient properties help in moisturizing and protecting the skin, while its ability to stabilize formulations makes it ideal for use in cosmetic products like lipsticks, skin creams, and hair waxes.

Candles

Ceresin is used in the manufacture of candles due to its ability to harden the wax, resulting in longer-lasting and cleaner-burning candles compared to those made from paraffin wax alone.

Lubricants and Greases

Ceresin is used in industrial applications as a lubricant or as a component of greases. Its high melting point makes it suitable for use in high-temperature environments where other lubricants might degrade.

Electrical Insulation

Ceresin is used in electrical insulation materials due to its resistance to electricity and its ability to maintain structural integrity under a wide range of temperatures.

Challenges and Future Directions

Although the extraction of ceresin from ozokerite is well-established, there are several challenges and areas for improvement in the process:

Environmental Impact

The extraction process, particularly solvent-based methods, can result in the release of harmful chemicals into the environment if not managed properly. Ensuring that extraction processes are environmentally sustainable is a priority.

Conclusion

Ceresin, derived from ozokerite, is a versatile and valuable material used in a wide range of industrial applications. The extraction process, though efficient, presents challenges related to environmental sustainability and cost-efficiency. Continued research into improving extraction techniques and developing more sustainable methods is essential for meeting the growing demand for ceresin in various industries. By improving the extraction and purification methods, ceresin can continue to be a valuable resource in industries ranging from cosmetics to industrial lubricants.