

Compuestos Inorgánicos de Estructura Compleja

Idioma: EN

INSTRUCTIONS:

No general instructions specified in the form, but there are 5 questions in the exam.

Question 1

Structure and bonding of silicates

STUDENT RESPONSE:

Silicates are a type of inorganic compound that are made up of silicon atoms and oxygen atoms. The structure of silicates is typically represented by the formula SiO_2 , where Si represents the silicon atom and O represents the oxygen atom. The bond between the silicon and oxygen atoms is covalent, and the bond between the silicon and oxygen atoms is also covalent. The structure of silicates is further classified by the number of oxygen atoms attached to the silicon atom, which can range from one to six. Borates are a type of inorganic compound that are made up of boron atoms and oxygen atoms. The structure of boranes is typically represented by the formula B_2H_6 , where B represents the boron atom and H represents the hydrogen atom. The bond between the boron and oxygen atoms is covalent, and the bond between the boron and hydrogen atom is also covalent.

Question 2

What is a borane? Classification of boranes

STUDENT RESPONSE:

A borane is a type of inorganic compound that contains boron and hydrogen atoms. Boranes are classified based on the number of hydrogen atoms attached to the boron atom, which can range from 1 to 12 or more. The classification of boranes is as follows:

1. Monoboronated boranes: These are the simplest boranes, with one hydrogen atom attached to the boron atom. Examples include borane (BF₃) and borane (BF₄).
2. Triboronated boranes: These boranes have three hydrogen atoms attached to the boron atom. Examples include borane (BF₃) and borane (BF₄).
3. Tetraborated boranes: These boranes have four hydrogen atoms attached to the boron atom. Examples include borane (BF₄) and borane (BF₃).
4. Pentaboronated boranes: These boranes have five hydrogen atoms attached to the boron atom. Examples include borane (BF₄) and borane (BF₃).
5. Hexaboronated boranes: These boranes have six hydrogen atoms attached to the boron atom. Examples include borane (BF₄) and borane (BF₃).
6. Heptaborated boranes: These boranes have seven hydrogen atoms attached to the boron atom. Examples include borane (BF₄) and borane (BF₃).
7. Octaboronated boranes: These boranes have eight hydrogen atoms attached to the boron atom. Examples include borane (BF₄) and borane (BF₃).
8. Nonagonoboronated boranes: These boranes have nine hydrogen atoms attached to the boron atom. Examples include borane (BF₄) and borane (BF₃).
9. Decagonoboronated boranes: These boranes have ten hydrogen atoms attached to the boron atom. Examples include borane (BF₄) and borane (BF₃).
10. Decagonionoboronated boranes: These boranes have eleven hydrogen atoms attached to the boron atom. Examples include borane (BF₄) and borane (BF₃).
11. Decagonionoboronated boranes: These boranes have twelve hydrogen atoms attached to the boron atom. Examples include borane (BF₄) and borane (BF₃).
12. Decagonionoboronated boranes: These boranes have thirteen hydrogen atoms attached to the boron atom. Examples include borane (BF₄) and borane (BF₃).

Note: The classification of boranes can be extended further, but the above classification covers the most common types of boranes.

Question 3

Give examples of the use of inorganic heterocycles in the synthesis of the corresponding polymers

STUDENT RESPONSE:

Inorganic heterocycles are widely used in the synthesis of various polymers due to their unique properties and reactivity. Some examples of their use in polymer synthesis are:

1. Boranes: Boranes are a class of inorganic compounds that contain boron atoms bonded to hydrogen atoms. They are widely used in the synthesis of boric acid, which is a strong acid used in the production of various polymers. Boric acid can be used as a coupling agent in the synthesis of boric-based polymers, such as boric-based acrylates and boric-based methacrylates.

2. Aluminum oxides: Aluminum oxides are a class of inorganic compounds that contain aluminum atoms bonded to oxygen atoms. They are widely used in the synthesis of various aluminum-based polymers, such as aluminum-based acrylates and aluminum-based methacrylates.

3. Graphite: Graphite is a naturally occurring form of carbon that has unique properties, such as high electrical conductivity and thermal stability. It is widely used in the synthesis of graphite-based polymers, such as graphite-based acrylates and graphite-based methacrylates.

4. Silicon dioxide: Silicon dioxide is a common inorganic compound that is widely used in the synthesis of various silicon-based polymers, such as silicon-based acrylates and silicon-based methacrylates.

5. Boron carbide oxides: Boron carbide oxides are a class of inorganic compounds that contain boron atoms bonded to carbon atoms. They are widely used in the synthesis of various boric-based polymers, such as boric-based acrylates and boric-based methacrylates.

These are just a few examples of the many ways in which inorganic heterocycles can be used in polymer synthesis. The specific use of these compounds will depend on the desired properties of the resulting polymer and the specific synthetic conditions used.

Question 4

Crystalline defects

STUDENT RESPONSE:

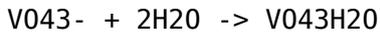
Silicatos laminares

Question 5

Explain the polymerization of vanadates, VO_4^{3-} as a function of concentration and pH

STUDENT RESPONSE:

The polymerization of VO_4^{3-} as a function of concentration and pH involves the formation of a polymer through the reaction of VO_4^{3-} with water. The reaction can be described by the following equation:



In this reaction, VO_4^{3-} reacts with two molecules of water to form a polymer of $\text{V}_2\text{O}_7^{4-}$. The reaction is exothermic, meaning that it releases heat. The polymerization process is influenced by the concentration of VO_4^{3-} and the pH of the solution.

At low concentrations of VO_4^{3-} , the reaction is slower and the polymerization is incomplete. As the concentration of VO_4^{3-} increases, the reaction proceeds more quickly and the polymerization becomes more complete. At high concentrations of VO_4^{3-} , the reaction is complete and the polymerization is no longer influenced by the concentration of VO_4^{3-} .

The pH of the solution also influences the polymerization of VO_4^{3-} . The reaction is more favorable at a pH of 7.5, where the concentration of VO_4^{3-} is highest. At lower or higher pH values, the reaction is less favorable and the polymerization is slower.

In summary, the polymerization of VO_4^{3-} as a function of concentration and pH involves the reaction of VO_4^{3-} with water to form a polymer of $\text{V}_2\text{O}_7^{4-}$. The reaction is influenced by the concentration of VO_4^{3-} and the pH of the solution, with the highest concentration and pH leading to the most complete polymerization.