MAGNETIC PROPERTIES OF ORES INTENDED TO SERVE AS FILLERS FOR POLYMERS

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Abstract: Minerals demonstrate different behaviors when exposed to magnetic fields. Some minerals exhibit strong magnetism and can become permanent magnets, while others display weak or negligible magnetic responses. The magnetic properties of minerals are primarily influenced by their chemical composition and crystal structure, especially the presence of magnetic elements such as iron, titanium, and manganese. This article examines the classification of magnetic minerals, the mechanisms responsible for magnetism in minerals, methods of testing magnetic properties, and the scientific and industrial importance of these characteristics.

Key words: magnetic responses, chemical composition, minerals, crystal.

Introduction

A magnetic field represents a special form of matter and exists in space as a system of forces that can be easily detected through their effect on magnetized bodies. The action of these forces on magnetized objects is explained by the presence of rapidly moving intramolecular electric charges within the material[1].

The magnetic field was first studied and described by the English physicist William Gilbert. The magnetic properties of electric current were discovered and investigated in 1820 by the Danish physicist Hans Christian Ørsted.

Magnetic fields are produced by bodies known as magnets. Magnets can be natural or artificial. In engineering and industry, only artificial magnets are commonly used, including permanent magnets and electromagnets.

A magnet that is freely suspended in space aligns itself in such a way that one of its ends, called a pole, points along the Earth's meridian toward the Earth's magnetic north pole, while the other points toward the magnetic south pole (in middle latitudes of the Earth)[2]. The pole directed toward the north is designated by the letter N and is called the north pole, while the opposite pole is called the south pole (S).

Magnetic fields can be detected using instruments such as electrointegrators, milliwebermeters, Hall sensors, and gaussmeters, or by using magnetic powders (metallic or magnetite powders). The particles of these powders arrange themselves along magnetic field lines that emerge from one pole of the magnet and enter the other. Magnetic field lines can penetrate through almost all materials.

Magnets possess the property of inseparability. This means that even if a magnet is divided into very small parts, each part still forms a magnet with two poles. Magnetism is a physical phenomenon produced by the motion of electric charges, resulting in attractive or repulsive forces between objects. In mineralogy, magnetic properties are important diagnostic features used to identify minerals and understand their formation. Minerals respond differently when placed in a magnetic field, and these differences help scientists classify and study them[3].

Magnetic properties are especially important in geology, mining, environmental science, and materials engineering. The study of magnetic minerals also plays a significant role in understanding Earth's magnetic field history and geological processes.

Different minerals behave differently under the influence of a magnetic field: some become magnetized and are attracted to the field, while others do not react to it.There is a small group of minerals and artificial materials (magnetite, nickel-iron, ferroplatinum) that possess clearly expressed magnetic properties[4]. After being placed in a magnetic field for a short time, they become magnets and can attract various metallic objects such as iron filings, nails, and others. There is also a larger group of minerals with weak magnetic properties that are only attracted by a magnet (ilmenite, pyrrhotite, pyrolusite, etc.).

The simplest way to test a mineral for magnetic properties is by using a freely rotating magnetic needle. The tested sample is brought close to the ends of the needle. If the magnetic needle deviates relative to the tested mineral, it indicates that the mineral possesses magnetic properties.

The magnetic properties of minerals are determined by the presence of magnetophore elements such as iron, titanium, and manganese.

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