Freeze crushing technology crushes solid waste, uses liquid nitrogen to cool down the waste power battery, uses the brittle fracture temperature difference of solid waste at low temperature to make the material brittle, and then crushing, not only good crushing effect, improve conductivity, increase induction current, conducive to subsequent eddy current sorting, and also has excellent effects in energy saving and noise reduction: the driving force required is about 1/4 of the crushing at room temperature, the noise is reduced by about 7 dB, and the vibration is reduced by 1/5–1/4.

Eddy current sorter innovation:

Automatic control device: a sensor is set under the magnetic roller to sense the working status and temperature of the magnetic roller, and is controlled by the network control system. Prevents dangerous situations such as overheating and short-circuit temperature differences.

Low cost and long service life: the core magnetic roller material is reduced, the conveyor belt is eliminated, the cost is reduced, and the loss of the device is reduced and the service life is more than doubled.

Solve technical problems such as stickiness: optimize the feeding system and the improvement of the sorting structure, eliminate the sticky material and material leakage problems when feeding the conveyor belt, 100 % feeding, and avoid the collision problem in the sorting process.

Safety and environmental protection: using mechanical and physical methods, compared with chemical reagents, the danger is low, the waste is less and the environmental pollution is small.

High sorting rate and small footprint: Compared with the traditional eddy current sorting device, which can generally reach 30–50 % when sorting metal particles below 5mm, the primary sorting rate of metal particles below 5mm can reach more than 90 % after the optimization of the structure of this device, which greatly improves the sorting rate. It is reduced by about 75 % and is easy to carry.

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REVIEW OF FERRITE RADAR ABSORBING METAMATERIALS

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Summary. *Ferrite absorbing metamaterials designed with metamaterial structures can effectively broaden the absorption bandwidth of electromagnetic waves. The current mainstream approach is to compound ferrite with other materials to produce ferrite absorbing metamaterials with better performance.*

Conventional ferrite wave-absorbing materials will undergo polarization rotation of reflected waves under longitudinal magnetization due to Faraday rotation effect, and will only absorb electromagnetic waves of a certain polarization under transverse magnetization [1]. Nowadays, ferrite absorbing metamaterials designed with metamaterial structures can effectively broaden the absorption bandwidth of electromagnetic waves. The current mainstream approach is to compound ferrite with other materials to produce ferrite absorbing metamaterials with better performance.

With the in-depth research related to ferromagnetic composite, the structure of ferrite and metal wire/stick composite has become a hot topic of research. 2001, Dewar [2] University of North Dakota, USA, first proposed to prepare wave-absorbing metamaterials by embedding periodically arranged metal sheets or metal wires directly into the ferromagnetic matrix. 2006, A. L. Adenot-Engelvin, P. Toneguzzo et al [3] studied the structure and outlined the basic topology on the laminate by metal wires as shown in fig. 1, which shows the strong anisotropy of the structure, fig. 1 shows the microwave permeability of the laminated composite using a 1 m thick CoFeSiB film deposited on a 23 m PET substrate (ferromagnetic volume fraction of 7 %) , fig. 1 shows a sketch of the wire composite, and fig.1 shows the microwave permeability of this composite with a ferromagnetic volume fraction of 7 %; after this Ji Zhou, Ke Bi et al [4] conducted an in-depth study of ferrite and metal wire/rod composite metamaterials, and experimentally demonstrated that a periodically arranged array of yttrium iron garnet (YIG) wire/rod composite with a metal wire array The structure formed is shown in fig. 1 (e–h), which shows obvious advantages in terms of tunability and loss, and is simple to prepare, and has some practical value in the preparation of devices as well as the miniaturization of devices.

The generation of the idea of using conductive materials to obtain magnetic properties that conform to the inductive mode led to the creation of the ferrite – coil structure. The structure is generally a copper helix wound around the core of a ferromagnetic composite. In 2005, Anne-Lise Adenot-Engelvin, Olivier Acher et al [5] investigated metamaterials based on the combination of ferromagnetic composites with inductive modes by coiling copper wires of 50 mm diameter with different numbers of loops and with periodically arranged metamaterial blocks were compounded with the structure shown in fig. 1, and the model view of the metamaterial blocks is shown in fig. 1. According to the experimental results, it is found that the resonant frequency varies with the inverse of the number of loops of the helix and is independent of the magnetic material. This structure solves the problem of microwave permeability of a metamaterial block consisting of a ferromagnetic composite (wire or laminate) and an inductive pattern.

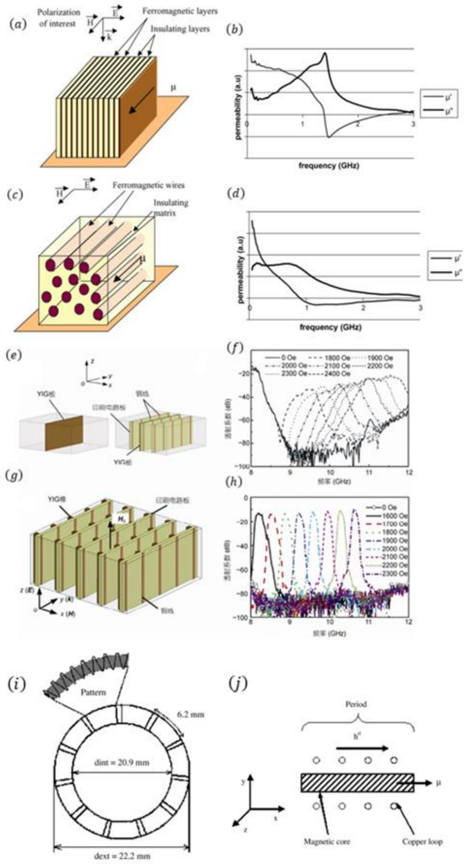

Figure 1 – The model view of the metamaterial blocks: a – Sketch of the laminate composite with his polarization of interest: direction of the permeability μ is perpendicular to the direction of the magnetization(in-plane uniaxial anisotropy); b – Microwave permeability of a laminate composite with ferromagnetic volume fraction of 7 %; c – Sketch of a wires composite in the polarization of interest: direction of the permeability μ is locally perpendicular to the direction of the magnetization (circumferential anisotropy in negative magnetostriction glass coated microwires); d – Microwave permeability of a wire composite with 7 % ferromagnetic volume fraction; e – Schematic diagram of YIG sheet/copper wire composite structure; f – Variation of transmission coefficient with frequency under different magnetic fields; g – Schematic diagram of YIG rod/copper wire composite structure; h – Variation of transmission coefficient with frequency under different magnetic fields; i – Schematic view of a sample with eleven metamaterial blocks; j – Modeled view of a metamaterial block and directions of external applied field on the magnetic core

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工业生态与节能——粉煤灰基 CO_2 吸附沸石绿色制备

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Summary. *CCUS carbon capture, utilization and storage is one of the key technologies to deal with global climate change, which has been highly valued by countries all over the world and has increased research and development efforts, but there are still difficulties in industrialization. This paper introduces a green preparation process of zeolite for carbon dioxide adsorption.*

Human beings release too much greenhouse gases such as CO_2 in production and life, and the anthropogenic increase in atmospheric greenhouse gas concentrations is the main factor of current and future climate change, and if measures are not taken, CO_2 concentrations will continue to increase for many years in the future [1]. As a major CO_2 emitter, China is facing arduous CO_2 emission reduction tasks, and carbon capture and utilization technology is one of the important technologies to solve this problem. At present, CO_2 capture technology has been industrially applied, and the preparation of high-efficiency CO_2 adsorbents is the most critical part. Based on the above problems, the research on finding better technologies to prepare high catchability for capturing and storing CO_2 and optimizing them to achieve the ideal level has been gradually emphasized. At present, there are many mainstream porous adsorption materials in the world,Such as type A zeolite, type X zeolite, ZSM-5, MOFs, etc. [2]. Peter G. Boyd et al. analyzed some porous materials with optimal adsorption for CO_2 adsorption separation through comparative studies.Patrick Nugent et al. [3] synthesized metal-organic framework materials with strong carbon capture performance. However, in the existing zeolite synthesis process, it is impossible to avoid the generation of waste liquid, and the treatment process of waste liquid will cause secondary pollution to the environment.

In addition, coal, as one of the most stable and effective energy sources in our country, will produce a large amount of fly ash in the process of its combustion. To 2000, China's coal ash emissions about 160 million tons. The treatment and utilization of fly ash has become a major environmental protection problem in today's world.Many teams have explored the influence of different synthesis methods on the types and properties of zeolite prepared from fly ash for the problem of how to rationally recycle and apply fly ash, a solid waste with huge emissions [4]. Wu Xuecheng's team [5] of Zhejiang University processed fly ash by acid leaching and alkali melting, synthesized various types of zeolite, and studied its adsorption performance, verifying the feasibility of zeolite synthesis from fly ash.

According to current theoretical analysis and previous experiments, four reaction parameters can be determined: alkali-ash mass ratio (referred to as alkali-ash ratio for short), crystallization time, liquid-solid mass ratio (referred to as liquid-solid ratio for short) and crystallization temperature.Among them, the ratio of alkali to ash affects the concentration of alkali in raw materials, and