

Study on Sintering Process of Magnetic Abrasive Particles

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Abstract. The magnetic abrasive prepared by sintering method, the aim is to change the internal structure of abrasive particles by sintering method, make the abrasive particles parceled on the surface of magnetic iron particles, and compared with the abrasive particles phase to get a kind of magnetic abrasive particles with high durability, strong magnetic, which can be magnetized in a magnetic field and improve processing efficiency and surface quality in magnetic abrasive machining. Sintering is used to prepare magnetic abrasive in this paper, to make iron particles, abrasive particles mixed with some binder, after suppression, drying, sintering, cooling, crushing and screening. This paper makes analysis for surface morphology and composition of the magnetic abrasive particles by scanning electron microscopy and discusses the effect that the abrasive particles size ratio, sintering time, sintering temperature on the magnetic abrasive, and the preparation of the magnetic abrasive process has been optimized.

Introduction

With the industrial development and improvement of mechanical product quality, the demand of part surface quality and accuracy gets more and more high. As some parts of complex shape, can't be machined by the traditional processing technology, therefore, the magnetic abrasive technique was proposed. The magnetic abrasive finishing method is to use strong magnetic iron particles and abrasive particles with grinding capacity mixed together (called magnetic abrasive) to add to the space (about 1~2mm) between the pole and the workpiece[1].

Owing to the effect of the magnetic force, the magnetic abrasive particles were restrained flying outward when enduring centrifugal effect. The magnetic abrasive particles along the magnetic force line form a certain rigid "magnetic brush", and press on the workpiece surface. When the relative movement between workpiece and magnetic poles take place, the "magnetic brush" will polish the workpiece surface[2].

The magnetic abrasive particles play a role in the magnetic abrasive finishing, at present for the magnetic abrasive particles preparation, our country is still at an experiment stage, not mass production; abroad only in Japan, Bulgaria and a few other developed countries, can achieve a certain degree of mass production. With the increasing maturity of the magnetic abrasive technology, the research and development for magnetic abrasive particles have become more and more urgent.

Preparation Process of Magnetic Abrasive Particles

Magnetic abrasive is a both high magnetic and high hardness composite material with certain mechanical strength, contains the ferromagnetic phase (high permeability, such as Fe powder, Fe₃O₄, etc), the abrasive particle phase (high hardness, such as Al₂O₃, SiC, ZrO, etc), and the binder. There are many methods for preparation, such as bonding method, sintering method and simple mixing method, etc. Bonding method is to use binder to make a certain proportion of mixed iron particles and abrasive particles bonded together, after solidifying, crushing, and screening, can get different size magnetic abrasive particles. Magnetic abrasive prepared by this method process using the equipment is relatively simple, and low cost, but easily oxidized, loosely organized, low density, and abrasive particles easily fall off. Simple mixing method is to make iron particles, abrasive particles and binder mixed in a certain proportion. The preparation process of this method is simple, but the iron particles