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A STUDY ON MICROSTRUCTURAL PROPERTIES OF ELECTROLYTIC IRON POWDER

SACHIN KUMAR[1], ASHUTOSH VERMA[2]

1.Assistant Professor, Department of Mechanical Engineering, Suresh Gyan Vihar University (SGVU), Jaipur, India

2.Assistant Professor, Department of Mechanical Engineering, Suresh Gyan Vihar University (SGVU), Jaipur, India

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Abstract: In recent years, the number of engineering components and automotive parts manufactured from shaped and sintered metal powders has increased. A number of research efforts have been done to improve the mechanical strength of green compact to enable green machining. However, such practices which have great benefits are still not followed in the industry due to lack of research in the field. Previous research depended on a number of process variables, such as particle size, compaction pressure, lubricating system and morphology, however further research is needed to develop proven technologies. The study of structural behavior of compacts made up of electrolytic iron powder 250-300 under different mesh has not so far been done; the powder is commonly used in the powder metallurgy industry and has wide range of applications. In this study the shapes and size of electrolytic iron powder have been studied by taking SEM (scanning electron microscope) and EDS images. The powder is mixed with impurities like, copper and graphite powder along with zinc at desired level. The properties are tested by varying resolution range of SEM. The study helps in selecting the optimal shape and size of electrolytic iron powder.

Keywords: Powder Metallurgy, Iron Powder, Green Strength, Micro Structural Test

Corresponding Author: SACHIN KUMAR

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INTRODUCTION

Powder metallurgy is one of the important parts of manufacturing section that enables the manufacturing of near net shapes and good dimensional accuracy. Shape and size of a powder component plays important role in compaction process.
The compressing behaviour depends on the size and shape of powder whether the powder is irregular, spherical, spongy etc. Spherical shapes provides less density in comparison to
Irregular shapes as when spherical powder when mixed with lubricant after compaction
It leaves gap between the molecules, but it is not same in case of irregular shape there is no gap between the molecules due to irregularity.

MATERIAL AND METHODS

Material

Iron powder

The electrolytic iron powder is used for the study as it has many applications such as in case of ferromagnetic parts. The mesh size is ranging from 250-300 for this study. The mesh is generally the sieve opening which is used to determine the shape of powder. The physical property of powder is shown in Table1.

Table 1: Physical characteristics of electrolytic iron powder

Physical characteristic	Value
Size	250-300 mesh and 300-350 mesh
Atomic Weight	55.85
Colour	A fine blackish powder
Purity	99.5 %
Bulk Density	2.05 g/cm^3

Methodology

The following methodology is used to carry out the operations:-

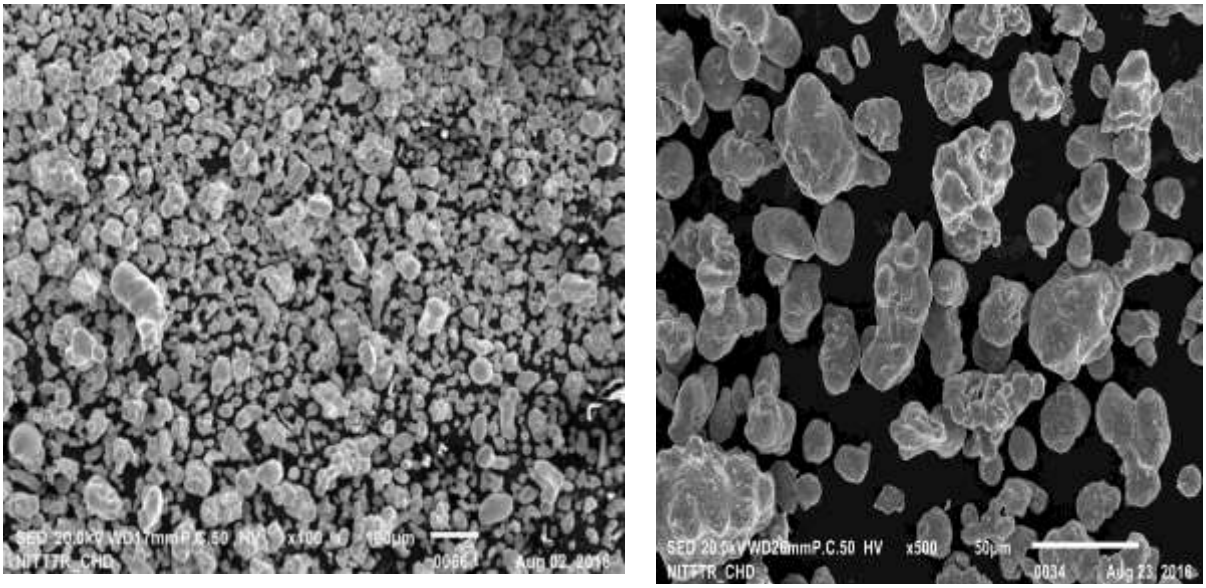
Procurement of powder from the market.
The powder as discussed above in table 1 is purchased from the powder industry.

Establishing proper arrangement in SEM analysis to carry out the study.
This deals with the proper arrangement of placing the powder particles on the cavity so as to obtain uniformity in distribution of the powder particles. Carbon tape is used so as to prevent the wastage of powder particles.

Selection of resolution range of the image.
The resolution range varied between X 100 to X 500.

SEM and EDS image of the particles.

The following image is obtained after analyzing the powder.



(a) X100 magnification **(b) X500 magnification**

FIG: 1 SEM image of 250-300 mesh electrolytic iron powder.

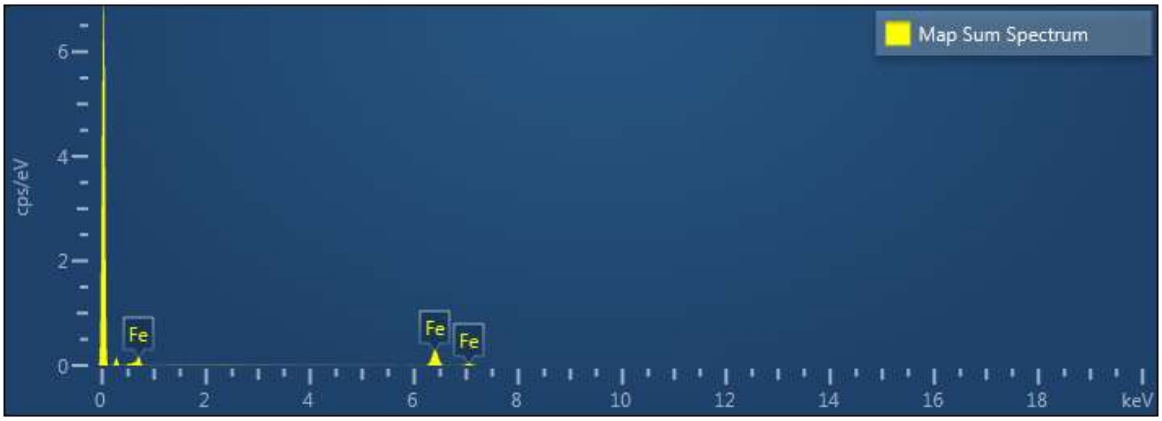


FIG: 2 EDS image of 250-300 mesh electrolytic iron powder.

DISCUSSION

The SEM image as shown in fig 1(a) and (b) at different resolution reveals that that the powder is spongy, spherical and irregular in shapes. The EDS that is electron image as shown in fig 2 confirms the presence of Fe.

CONCLUSION

The powder shapes revealed that due to irregular shapes of the particles after compaction the compact so formed may high density as due to irregularity of the shape. The EDS image confirms the purity of the powder as only component of iron can be seen in the electron image of the particles.

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