

Characteristic of Magnetic-Substance Classification from Coal Bottom Ash Using Wet Magnetic Separator

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ABSTRACT

The coal-fired power plant has generated about 5 million tons of the coal bottom ash, in Korea. Although the coal bottom ash could be used in many fields effectively through the physical treatment-process (classification, magnetic separation, flotation, gravity concentration and etc), all of that has been treated as reclamation of the landfill until now. If the coal bottom ash which contains various materials, such as silicate, unburned carbon, aluminate, hematite and magnetite can be separated respectively, it will obtain the high-value products in recycling field. Especially, in the case of the magnetic-substance (ferromagnetic material), it is easy to be removed by magnetic separation. So, in this study, we investigated the characteristic of magnetic-substance classification from coal bottom ash using wet magnetic separator. Then the ferromagnetic material per coal bottom ash (w/w,%) under 0.075mm was studied by wet magnetic separator as a various magnetic force. Also, the content rate of ferromagnetic material and the majority of that were confirmed.

INTRODUCTION

The coal-fired power plants generate the coal bottom ash (CBA) which accounts for approximately 5 million tons in Korea. The coal ash largely divided into fly ash and bottom ash. In the various field such as concrete products, aggregate and structural fills/road base, fly ash has been recycled. Conversely, the CBA has been used in only a part restricted within narrow field. Also, the most amounts of that have treated as reclamation of the landfill because of content of pyrite and unburned carbon (UC) as well as non-homogeneity of particle sharp and property. But, CBA has many structural materials. Therefore, many studies about recycling of coal bottom ash have investigated steadily. It is one method out of many studies that the physical separation (classification, magnetic separation, density separation and flotation etc.) is effective process to treat the CBA. So, silicate, aluminate and iron oxide are separated by physical separation as

different properties of matter. For pre-treatment of CBA through physical separation, it is necessary to most economic and efficient method. Especially, in the case of the magnetic-substance (hematite and magnetite), it is easy to be removed by magnetic separation. So, in this study, we investigated the characteristic of magnetic-substance classification from coal bottom ash during wet magnetic separation. Also, the recovery of magnetic-substance (ferromagnetic material) through wet magnetic separator as a various magnetic force was studied, and the majority of ferromagnetic material per coal bottom ash (w/w,%) was confirmed.

MATERIAL AND EXPERIMENTAL METHOD

The coal bottom ash(CBA) used in this experiment was collected from a reclamation place (pond) near Bo-ryung power plant. Water content of CBA showed high percentage of 57.78%. So, we treated CBA in a dry oven for 24 hours in 45°C. Bottom ash was divided into fine size fractions by standard sieves of 0.075mm after dried. The fine sample was separated by wet magnetic separator as a magnetic force. The magnetic force was adjusted by 200gauss, 2000gauss and 4000gauss.

RESULTS AND DISCUSSION

Content of ferrous material in coal bottom ash

The main compositions of CBA which remained after combustion are silicate, aluminate, carbonate and ferrous material and Table 1 shows the chemical composition of CBA.

Table 1. Chemical composition of coal bottom ash

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	CaO	MgO	K ₂ O	NaO ₂	TiO ₂	MnO	L.O.I.
Coal bottom ash	44.14	23.77	13.96	12.6 9	0.77	0.53	0.25	1.48	0.23	1.47

Characteristic of magnetic separation from coal bottom ash

Firstly, we chosen the sample of CBA under 0.075mm, and separated it by using wet magnetic separator as a different magnetic force (200gauss, 2000gauss and 4000gauss). Fig. 1 shows the distribution ratio of CBA after wet magnetic separation process. 200gauss and 2000gauss were effective force to separate the ferromagnetic material, but 4000gauss was not enough.

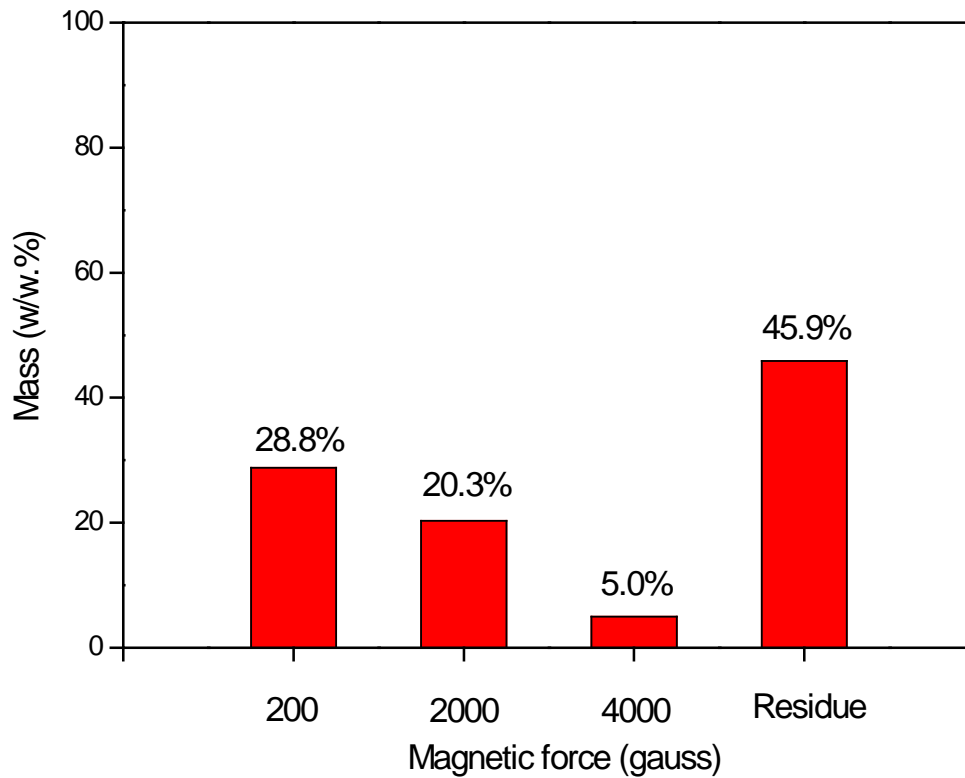


Fig. 1. Distribution ratio of coal bottom ash in the size of under 0.075mm after wet magnetic separation as a magnetic force.

Fig. 2 shows the pictures of ferromagnetic material separated by wet magnetic separator in 200gauss. It has a magnetite's look, dense mineral, black but sometimes dark gray.



Fig. 2. Picture of ferromagnetic material separated by wet magnetic separator in 200gauss

CONCLUSION

In this study, we investigated the characteristic of magnetic-substance classification from coal bottom ash (CBA) using wet magnetic separator. Then the ferromagnetic material per coal bottom ash (w/w,%) under 0.075mm was studied by wet magnetic separator as a various magnetic force. Also, the content rate of ferromagnetic material and the majority of that were confirmed. In the result, 200gauss (recovery rate was 28.8w/w.%) and 2000gauss (20.3w/w.%) were effective force to separate the ferromagnetic material from CBA under 0.075mm, but 4000gauss was not enough. Ferromagnetic material of 200gauss has a magnetite's look, dense mineral, black but sometimes dark gray.

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