Characterization of Carbonized Porous Media manufactured by Sewage Sludge in Pyrolysis conditons

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1. Introduction

Sewage sludge in South Korea is suited to use as a construction environmental materials rather than energy since it has high contents of moisture and mineral with lower caloric value. Interest in rooftop greening and eco-friendly construction has led to more demand of functionsl materials, such as lightweightness, adiabaticity, adsorption of pollutant/fertilizer, heat resistance and electromagnetic interception. The recycled carbonized porous of sewage sludge, a development of artificial materials, has potential to provide various enviornmental functions by having porosity and physicla strength.

2. Experimental

The sludge sample at the sewage treatment plant in G city is used after making the optimum water content mixed with clay. The dried sludge was produced by mixing and extruding, pelletizing, drying, sintering, and cooling/drying steps; additionally, the aggregate was manufactured to Ø10mm. The pyrolysis was calcinated in a furnace under an oxygen-free atmosphere by injecting a certain amount of nitrogen. It was cooled in air after calcination.

3. Results and Discussion

By examining porosity and open porosity according to carbonization temperature, the porosity increased dramatically as the carbonation temperature rose. It reached the peak at 900–1,050 ℃ and decreased after 1,050℃. The open porosity showed a similar pattern to the porosity changing trend; however, ratio of the open porosity decreases as the temperature increases.

The pore distribution accoding to carbonization temperature mostly consisted of the pore size of 30-100 Å over the range of carbonization temperature. As the carbonization temperature increases, the amount of micropores rises; but, the distruction is examined since the amount of larger pores increases. The average pore size has regularly been about 39 Å inside and outside.

The specific surface area increased with increase of carbonization temperature; however, the changes with time at the same temperature is insignificant. The reaction time was appropriate over 30 minutes. In addition, the mechanical strength depending on the carbonization temperature was measured by the compressive strength. The strength increases with the carbonization temperature. The compressive strength at 1000℃ is twice stronger than at 600 ℃; as well as, there was a dramatic increase at 900 -1000 ℃ compared with other sections.

4. Conclusions

The analysis of the characteristics of the porous carbon bodies according to the pyrolysis revealed that the effect of the carbonization temperature is much more affected among the carbonization temperature and reaction time. The physical strength was increased at more than 1000 ℃ and the reaction time was more than 30 minutes to get enough results.

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