Study on Fuel generated of dyeing wastewater sludge by pyrolysis(Carbonization)

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1. Introduction

Carbonization is a kind of pyrolysis process to produce char from organic materials under an inert atmosphere. In order to evaluate the quality of char as fuel, proximate analysis and caloric value were examined. The composition of raw sludge had a significant influence on the quality of produced char. The higher the ratio of carbonate and volatile matter in sludge, the higher caloric value of char produced.

Moreover, an equation to estimate caloric value of char was developed by using the weight fraction of fixed carbon and volatile matter in char. Temperature's control was performed to improve the quality of char. But the char's caloric value was lower than common fuel such as coal, petrol, briquet etc.

Therefore, the char was mixed with high caloric value's matter such as coal, briquet etc. for using available fuel. In this study, chars derived from dyeing wastewater sludge were characterized from the standpoint of solid-fuel and reducing quantity of sludge. Dyeing wastewater sludge dried sludge were carbonized at 350°C, 450°C and 550°C for 20 - 30 min. under anoxic.

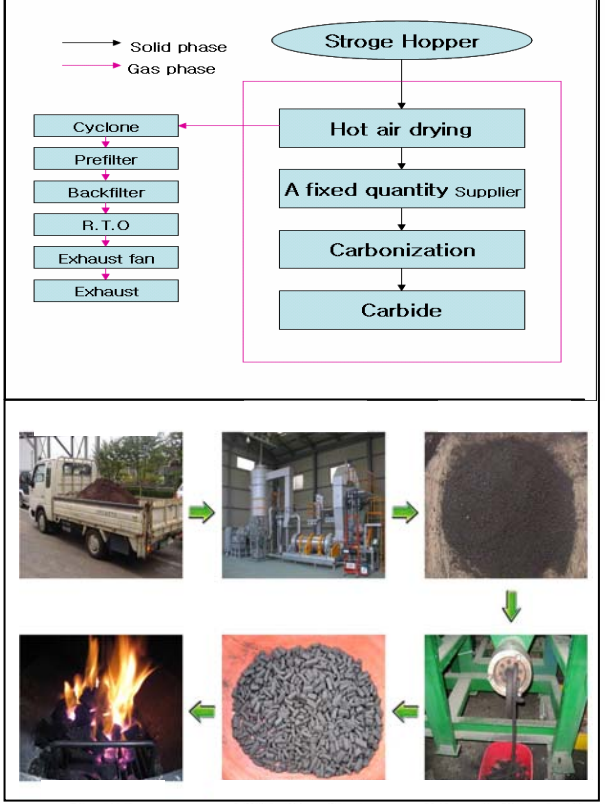
2. Materials and Methods

Dyeing wastewater sludges used in this study were taken from a synthetic textile dyeing factory located in Daegu industrial dyeing complex, Daegu City, Korea. Flow diagram of 50kg/h pilot scale dry and carbonization process and Operation condition for drying and **Carbonization** process were showed following table 1 and figure 1.

(Table 1) Operating condition for dry and carbonization process

Drying stage	Entrance Temp	385~430℃
	Outlet Temp.	165~190℃
	RT	20~40 min
Thermal	RT	25 min

decomposition stage	Combustor Temp.	850℃



(Figure 1) Flow diagram of 50 kg/h pilot scale Drying and Carbonization process

3. Result and disccution

3.1. Characteristics of drying and carbonization sludge

Table 2. shows the results of drying and carbonization. The reduction rate weight and volumn was 67% at the drying stage and 29% at the carbonization stage (totally 96%). The thermal characteristics of drying and carbonization products were 3,594kcal/kg respectively, and 3,102kcal/kg respectively.

3.2. Assessment of carbide as solid- fuel.

Table. 2. Characteristics of drying and carbonization

Contents		Moisture (%)	Volatile (%)	Ash (%)	H.H.V. (Kcal/kg)
Raw sludge	Mean	84.21	56.74	33.29	-
drying	Mean	26.11	63.33	36.67	3,594
Carbo-nization	350℃	2.98	58.11	41.89	3,660
	400℃	3.49	54.35	45.65	3,423
	500℃	3.32	34.03	65.97	2,529
	550℃	2.52	33.28	66.72	3,064
	Mean.	2.94	43.6	56.39	3,102

It was evaluated whether carbonization would be available as a new technology for thermal treatment and recycling waste as fuel. We were tried utilize organic waste sludge from dyeing wastewater treatment plant as a starting material to process a solid fuel.

Therefore, we have investgated with possibility of carbide as soild-fuel. Quality of dyeing sludge carbide for solid fuel's Characteristics are showed below table 3. Carbide's (after carbonization) caloric value are 3,000 kcal/kg). This results are not enough caloric valve(>3500kcal/kg) for standard quality of soil fuel. So we were mixed with soft coal for increased caloric valve(upto 3500kcal/kg).

Table 3. Quality of dyeing sludge carbide for solid fuel

Contents	Standard quality of Solid fuel	carbide	Soft-coal	Solid fuel (carbide : Soft-coal)	
				2:8	3 7
Caloric value (kcal/kg)	>3,500	3,000	6,880	6,104	5,716
Ash (%)	< 20	40	11	16.8	19.7
Moisture (%)	< 10	4	6	5.6	5.4
Chlorine (%)	<2.0	1.4	0.7	0.84	0.91

4. Conclusions

As a result of conduction a study on it, it has been demonstrated that in case the carbonization is adopted in treatment of waste, the follwing Characteristics are embodied. reduction of environmental pollution load, recycling the final treated material as resources and alternative energy source such as solid fuel. From the national point of view, it is necessary to support a study on carbonization which is available as a technology for recycling waste stably and further five a legal qualification for thermal treatment to it in the future

5. Acknowledgements

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6. REFERENCES

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