

Evaluation of Needle Coke Appearance by Illumination by Reflected Light

*K.Matsuoka ,T.Fujii, Y.Fujii, T.Miura, T.Oyama and E.Kitajima
Marifu Refinery, KOA OIL CO.,LTD.
6-1-1 Waki,Kuga, Yamaguchi,740,Japan*

1.Introduction

It has been known that appearance of needle coke are very important quality for needle coke as well as coefficient of thermal expansion (CTE) ,real density(RD) and puffing . The key point for evaluation of needle coke appearance are its luster and degree of needle of particle shape . We have proposed the simple way to make the quantitative method for evaluation of particle shape.[1] However, the coke luster was evaluated by some qualitative method so far. In this study ,we have developed the quantitative evaluation method of coke luster by measuring of intensity of reflected light using Image Analyzer.

2.Experimental

Some analytical data of six needle coke samples are summarized in Table.1. These samples were ground to prepare for three particle size as follows. [particle size range(mm) I ;0.075~0.15 II ;0.15~0.60 III;0.60~1.40]

The intensity of reflected light was measured by Image Analyzer. The pixels on image(512×479) of taking by the CCD camera were classified to 256 stages by intensity of reflected light using analyze application and were counted the number of them.

The average value of the intensity of reflected light was calculated from histogram as shown in Fig.3-A,B.

3.Results

The relationship between intensity of reflected light of six samples and particle size were shown in Fig.1, the bigger particle size showed the smaller intensity of reflected light. The order of intensity of respective coke sample at particle size range II was in accord with that of coke luster evaluated by observers vision as shown in Fig.2. The sample A which has the highest average value of intensity has much pixels of high intensity than sample F as shown in Fig.3-A,B.

4.Discussion

There are two purpose on this study. One is how to make the quantitative evaluation of coke luster. In the industrial field, it is important that coke luster is evaluated by automatic apparatus. The evaluation of the order of coke luster by Image Analyzer was in accord with the order by our vision. This result may satisfied with the purpose on the industrial field.

Another is what property decide the coke luster. The intensity of reflected light depend on the particle size of coke and the bigger particle size showed the smaller intensity of reflected light. Each samples showed respective intensity in case of measurement of same particle size.

The intensity of reflected light may depend on the degree of flow texture and crystallinity of coke. The authors examined the relationship between intensity of reflected light and CTE and RD as shown in Fig.4 and Fig.5. Higher CTE of coke tend to have lower intensity of reflected light and the lower RD of coke tend to lower intensity of reflected light have in all. Generally, it is said that low CTE and high RD of coke has excellent texture and crystallinity. The coke luster may depend on the degree of flow texture and crystallinity of coke.

5.Conclusion

In this study, We have examined about the measurement of intensity of reflected light to evaluate the order of coke luster quantitatively. The evaluation of the order of coke luster by Image Analyzer was in accord with the order by our vision. There are the relationship between coke luster and CTE and RD of coke properties in all. This method may be useful for evaluation of needle coke quality.

Reference

- 1 H.Nakagawara, K.Higashi, T.Oyama, J.Kanekiyo and Y.Todo
Extended Abstract of 21st Biennial Conference on Carbon(1993), pp.302~303

Table-1 Properties of Needle Coke

Sample	Coke Properties		
	CTE $\times 10^{-6}/^{\circ}\text{C}$	RD g/cm^3	The order of Coke luster*
A	0.91	2.141	①
B	1.19	2.133	②
C	1.28	2.139	③
D	1.31	2.137	④
E	1.52	2.131	⑤
F	2.42	2.127	⑥

*The order of coke luster was evaluated by observers vision

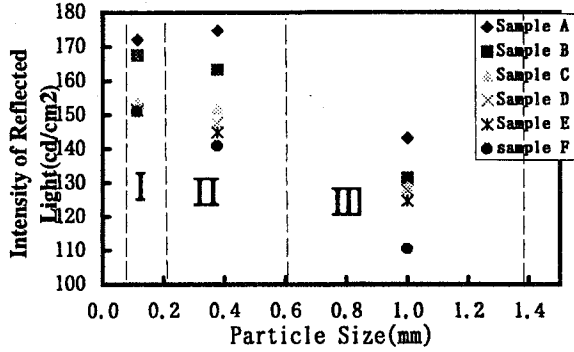


Fig.1 Relationship between Intensity of Reflected Light and Particle Size

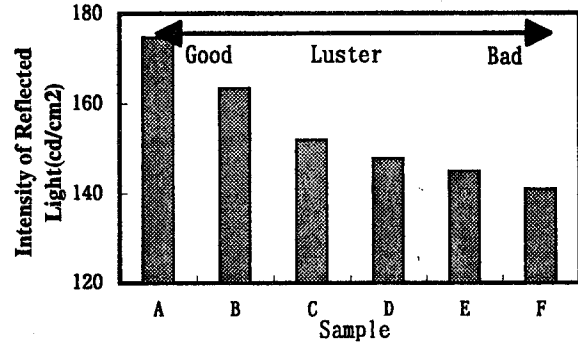


Fig.2 Relationship between Intensity of Reflected Light and The Order of Coke Luster

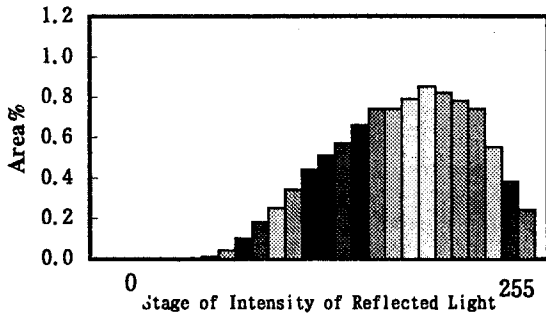


Fig.3-A Histogram of Intensity of Reflected Light(Sample A) (=Range II)

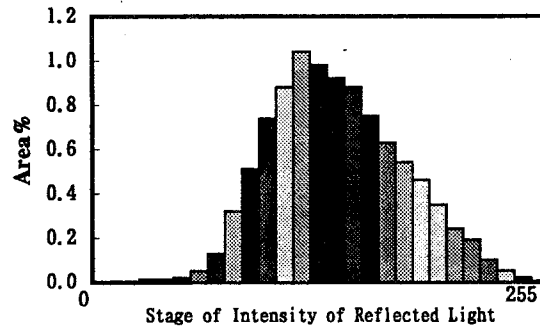


Fig.3-B Histogram of Intensity of Reflected Light (Sample F) (=Range II)

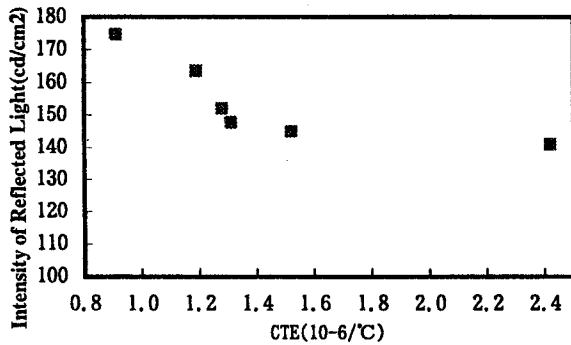


Fig.4 Relationship between Intensity of Reflected Light and CTE (=Range II)

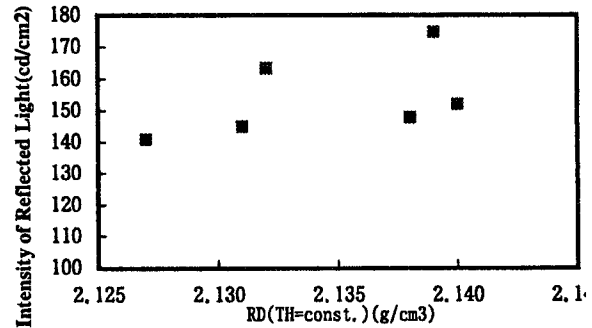


Fig.5 Relationship between Intensity of Reflected Light and RD (=Range II)