REACTIVITY OF INERTINITE (COAL-TYPING) OF WESTERN CANADIAN COKING COAL

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ABSTRACT

An accurate evaluation of coal-type, expressed as inertinite-content, can be calculated from whole-coal reflectograms by using a Reactive-Cutoff technique. A linear relationship between $R_o$max and the Reactive Cutoff, which has been determined from study of 76 carbonized Canadian coals of different rank and petrographic composition, can be used for this purpose.

KEYWORDS

Reflectograms; Reactive-Cutoff; calculated inerts; coal-type.

INTRODUCTION

in a typical Western Canadian coking coal, as much as one half of the macerals are semifusinite, and so it is important to know, with some assurance, how much of this material is reactive. According to the approach of Shapiro, Gray & Eusner (1961), the level of reactivity is fixed, and follows the equation:

$$R = kT$$

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where R = Reactive semifusinite,
      k = a constant, semifusinite reactivity, and
      T = Total semifusinite.
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The Schapiro et al. method considers that k, semifusinite reactivity, has a constant value of 0.33, equivalent to 33% of the total semifusinite.

Using this approach however, petrographers around the world have experienced difficulty in accurately predicting coke strength of inertinite-rich coal. This suggests that there is a problem with the recognition of semifusinite, or that the assumed fixed level of semifusinite reactivity is incorrect. To overcome these problems, the following Reactive-Cutoff technique is proposed.

METHOD

On a suite of 76 samples, which had previously been carbonized in test-ovens, and for which coke strength data were available, $R_o$max, a parameter of rank, was measured. As well, two new parameters, **Calculated Inerts**, and the **Reactive Cutoff**, were determined for each of these samples by iterative computation. Calculated Inerts is the theoretical quantity of inertinite macerals & mineral-matter required to produce the determined coke-strength from a coal with a known vitrinite distribution. The Reactive Cutoff, which is the random reflectance value that separates reactive- from inert-macerals on a reflectogram, provides this required level of Calculated Inerts.

RESULTS

It was found that for the range of vitrinite reflectances studied (0.89% to 1.63%), there is a strongly correlative linear relationship between $R_o$max and the Reactive Cutoff (R^2=0.92). The equation of this line is:

$$\text{Reactive-Cutoff Value } (R_o\ \%) = 0.987(R_o\text{max}) + 0.236$$

This implies that for any coal, the Reactive Cutoff can be calculated, and the distinction between reactive- and inert macerals can be made wholly on the basis of random reflectance.

CONCLUSION

By using the Reactive-Cutoff method, described in this paper, to distinguish between inert- and reactive macerals during coal-type analysis, it is no longer necessary to be able to recognize semifusinite macerals. Nor is it important to know what proportion of semifusinites are reactive.

For a new coal, $R_o$max of the vitrinites is determined, and the Reactive-Cutoff is calculated. From a reflectogram, the proportions of reactive- and inertinite-macerals can be measured. This value, corrected for mineral-matter is then used in coke-strength calculations.

initial indications are that this method of coal-type analysis is likely to generate coke-strength predictions with a greater degree of assurance than was previously possible.

It should be appreciated however, that when used in coke-strength prediction this approach to determining coal-type may be coke-oven specific, and may require calibration for other ovens and operating conditions.

REFERENCE

Schapiro, N., R. J. Gray, and G. R. Eusner (1965). Recent developments in coal petrography. Blast Furnace, Coke Oven and Raw Materials Committee, Proc, 20, 89-112.