PREDICTING COKING PRESSURES THROUGH A COMBINATION OF DIFFERENT ANALYTICAL PARAMETERS

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Abstract:
Coke oven degradation by high swelling coals is one the major causes of battery ageing. Indeed, dangerous coking coals can damage coke ovens due to the high wall pressures exerted. Although coke swelling pressure is not a new problem and has been investigated in the past, there is no simple, reliable and cheap methodology to predict high wall pressures. Therefore, the aim of this study is to effectively identify dangerous coking coals and predict their wall pressures using a combination of different parameters obtained from laboratory tests.

Fourteen coals of different rank and different geographical origins were characterized through high-temperature rheometry. The complex viscosity and expansion/collapse of the coal mass was recorded as a function of temperature. Relationships were established between parameters from different analytical techniques to enhance the understanding of the effect of the gas phase and elasticity of the coal matrix on pressure generation. In addition, these relationships were used to simplify the number of parameters required to predict equivalent wall pressures. From the parameters studied, the Sapozhnikov contraction (x), inertinite content, minimum complex viscosity (η*) and expansion of coal mass during softening (e) were found to be independent parameters. As a result, a simple diagram based on inertinite content, x and η* is proposed to identify coking coals that generate wall pressures > 15 kPa.

Keywords: coal, wall pressure, carbonisation, rheometry, Sapozhnikov.

Acknowledgement: The research leading to these results has received funding from the European Union's Research Programme of the Research Fund for Coal and Steel (RFCS) research programme under grant agreement No. [RFCR-CT-2010-00006]. The authors would also like to thank Dr Tatiana Rozhkova from Centre de Pyrolyse de Marieuau (CPM) in France for supplying the coals.

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