

## Importance of mineral matter simulation and understanding in gasifier technology selection

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This paper will illustrate the importance of utilizing multiple characterization and experimental techniques in support of each other, to understand coal mineral matter behaviour during thermal processing. It also emphasizes the inter-correlation and support between different characterization tools, i.e. ash flow temperature analyses (**AFT**), high temperature X-ray diffraction (**HT-XRD**), thermo-equilibrium simulation of inorganic components (**FACTSAGE™ simulation**) and scanning electron microscopy (**SEM**) analysis.

The mineral matter behaviour is difficult to predict under the complex conditions which arise during coal conversion processes. Numerous empirical indices and experimental procedures have been developed for assessing the slagging and fouling behaviour of coal and is still widely used. However, specific coal sources frequently give misleading results when these indices are used, thus making the results somewhat unreliable. The difficulties involved in predicting ash behaviour and the associated mineral matter transformations, highlight the need to understand the mechanisms involved in ash formation, in order to relate the problems accurately.

Over the years a wide range of testing and evaluation procedures have been developed to assist in the selection and/or optimal use of coal sources. The expected performance of the coal can then be predicted from empirical correlations that relate coal properties to plant performance. The procedures range from bench-scale tests to pilot plant evaluations. Laboratory analyses offer a cheap and easy method for coal evaluation. However, some coal tests also have limitation and concerns with regards to repeatability. This failure of some of the conventional procedures to accurately predict the performance characteristics of some coal sources is leading to reassessment of the standard coal tests. Coals are complex heterogeneous solids that vary widely in composition and properties and hence it is not surprising that tests developed on one type of coal can result in misleading results for other types of coal.

Keywords: AFT, HT-XRD, FACTSAGE™ simulation and SEM