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Ionizing Radiation as Imaging Tool in Coal Characterization and Gasification Research

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Around 70 million tones of coal are burned annually in power stations whilst around 50 million tones of coal are converted to chemicals in the petrochemical sector in the same period of time. Researchers, nationally and internationally, aim to optimize the processes to extract the most energy from the limited coal reserves. One such petrochemical process that is of significance to South Africa is gasification, since many industrially important chemicals and fuels are produced through the gasification process of coal. The process of gasification is influenced by many factors including temperature, pressure, coal composition, coal size, etc. and an understanding of each of these factors is crucial to optimize and manage a gasifier. The primary ways in which information is obtained on these factors are usually destructive experimental methods that are applied to powders and small particles. Powders and very small particles are not representative of the mined coal since it usually represents either average or homogeneous coal structures. It is therefore beneficial to conduct research on coal in order to study the coal structure and processes to beneficiate coal in a non-destructive fashion. One such technique is micro-focus X-ray Computed Tomography (CT) which enables the researcher to visualize and quantify the coal composition and spatial distribution of constituents and voids (cleats and fractures). Armed with this knowledge the scientist can investigate and optimize conversion processes such as gasification as well as other physical process (methane extraction and carbon dioxide adsorption). This presentation deals with the characterization of coal and the investigating of the first stages of gasification in a non-destructive manner. Coal particles with two distinct coal macerals (organic components) were investigated and the information obtained was compared to data from a thermo gravimetric analyzer (TGA). The main objective of this study was therefore to obtain a better understanding of gasification through a non-destructive analytical technique.

Level (Hons, MSc, PhD, other)?

MSc

Consider for a student award (Yes / No)?

No

Would you like to submit a short paper for the Conference Proceedings (Yes / No)?

No

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