Contribution ID: **156** Type: **Poster Presentation**

Structural changes associated with the differential expansion of coal during rapid heating - a preliminary study

Wednesday, 9 July 2014 17:10 (1h 50m)

Abstract content
   (Max 300 words)
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Coal is a major energy source and is widely used in industrial processes such as synthetic gas production and numerous research projects concern the optimal utilization of this limited natural resource. Char formation or devolatilization is the precursory step in many industrial important processes where the coal is prepared for subsequent processing in order to exhibit certain desired characteristics like fracture surfaces for maximum reactivity in combustion or carbon monoxide production to name but a few. Thermal cracking occurs easily in processes that entail a steep temperature gradient and high pressure (like blast furnaces and gasifiers) and merits further investigation since the alteration of the coal structure during these conditions will consequently affect the behavior of the resulting char. The fractures that develop during these initial phases of reaction open up pathways to reaction sites and consequently affect the reactivity of the coal.

Micro-focus X-ray tomography is a very attractive method to investigate these processes in a quasi dynamic manner since the non-destructive nature of this analytical technique permits using the same sample during numerous stages of a process. Investigating the process of thermal shock requires developing a suitable experimental method to induce and track the induced fractures and consequently an experimental setup and procedure is proposed by utilizing a RF coil to induce a very steep temperature gradient within a graphite cylinder which encapsulates the sample under investigation, whilst micro-focus X-ray tomography will be utilized to quantify the associated alteration in the coal structure after cooling.

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Session Classification: Poster2

Track Classification: Track F - Applied Physics