Abstract:
Coal continues to be one of the main fuels used for generation of energy in the UK. Despite government’s plans to decarbonise the energy sector in order to meet GHG emission targets, co-firing of coal and biomass is attractive due to the low investment required and since gas prices remain high, the consumption of coal is still considerable in power generation.

Pulverised coal has been known to pose explosion risks since the 19th century. The objective of the present work was to compare the explosibility of two coal samples used in UK power stations which potentially can be used co-fired with biomass. Both samples of coal were fully characterised for their chemical composition as well as particle size and morphology. The 1m³ ISO explosion vessel was used to determine the explosion characteristics: deflagration index ($K_{st}$), maximum explosion pressure ($P_{max}$) and minimum explosible concentration (MEC). Flame speeds were also measured. The remaining residues after explosion were also analysed. The results were compared to the explosion characteristics of other types of coal available in the literature.

Despite the very similar composition of both fuels, the reactivity of Colombian coal was much higher, with a $K_{st}$ value of 129 bars⁻¹ as opposed to 73 bars⁻¹ for Kellingley coal (Fig.1). There was significant difference between these two coals as the surface area of Colombian coal was 5 times higher than that of Kellingley coal. There was little difference in the elemental composition, but Colombian coal contained more volatiles and less ash. Thus the results indicate a strong impact of particle surface area and volatile content on the reactivity of coal.

Keywords: coal, biomass, dust explosion, explosion reactivity

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