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EXPLOSION CHARACTERISTICS OF PULVERISED COLOMBIAN COAL, PINE WOOD AND THEIR MIXTURES

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1. Introduction

Co-firing of coal and biomass is a readily implementable, cost effective option of introducing biomass into the European power generation capability. Pulverised coal and biomass can be blended in various proportions and used as fuels in co-firing plants with a subsequent reduction in greenhouse gas emissions. Coal powders have well known explosion hazards and the explosion characteristics for many coals are available in the literature [1], however, data for biomass explosibility are scarcer due to some characteristics of biomass that prevent their characterisation using the existing standard methods [2]. The explosibility of coal/biomass blends is also unknown. The aim of the present work is to provide explosion characteristics and combustion properties such as flame speeds and burning velocities of coal and biomass blends and compare their reactivity to that of coal and biomass alone.

2. Experimental

Fully characterised samples of pulverised Colombian coal, pine wood pellets and their blends (containing 5%, 15%, 20% and 40% biomass by mass) underwent explosion tests in the Leeds ISO $1m^3$ explosion vessel. Flame speeds were also measured and laminar burning velocities of the mixtures were derived. The residues after explosion tests were collected and analysed.

3. Results

Results (Fig.1) showed that Colombian coal was particularly reactive, whereas K_{st} for pulverised pine wood pellets was low due to presence of larger particles. Maximum explosion pressures reached around 8.5 bar regardless of particle size or sample composition. Blends with a high proportion of biomass (20% or more) showed a synergistic effect in their reactivity reaching K_{st} values higher than both coal and biomass alone (ca.150 $barms^{-1}$).

4. References

[1] Eckhoff, R.K., Dust Explosions in the Process Industries. 3rd ed. 2003, USA: Gulf Professional Publishing. 719.

[2] Wilén, C., et al., Safe handling of renewable fuels and fuel mixtures. 1999, VTT Technical Research Cenre of Finland: Espoo. p. 117 p.+app. 8p.

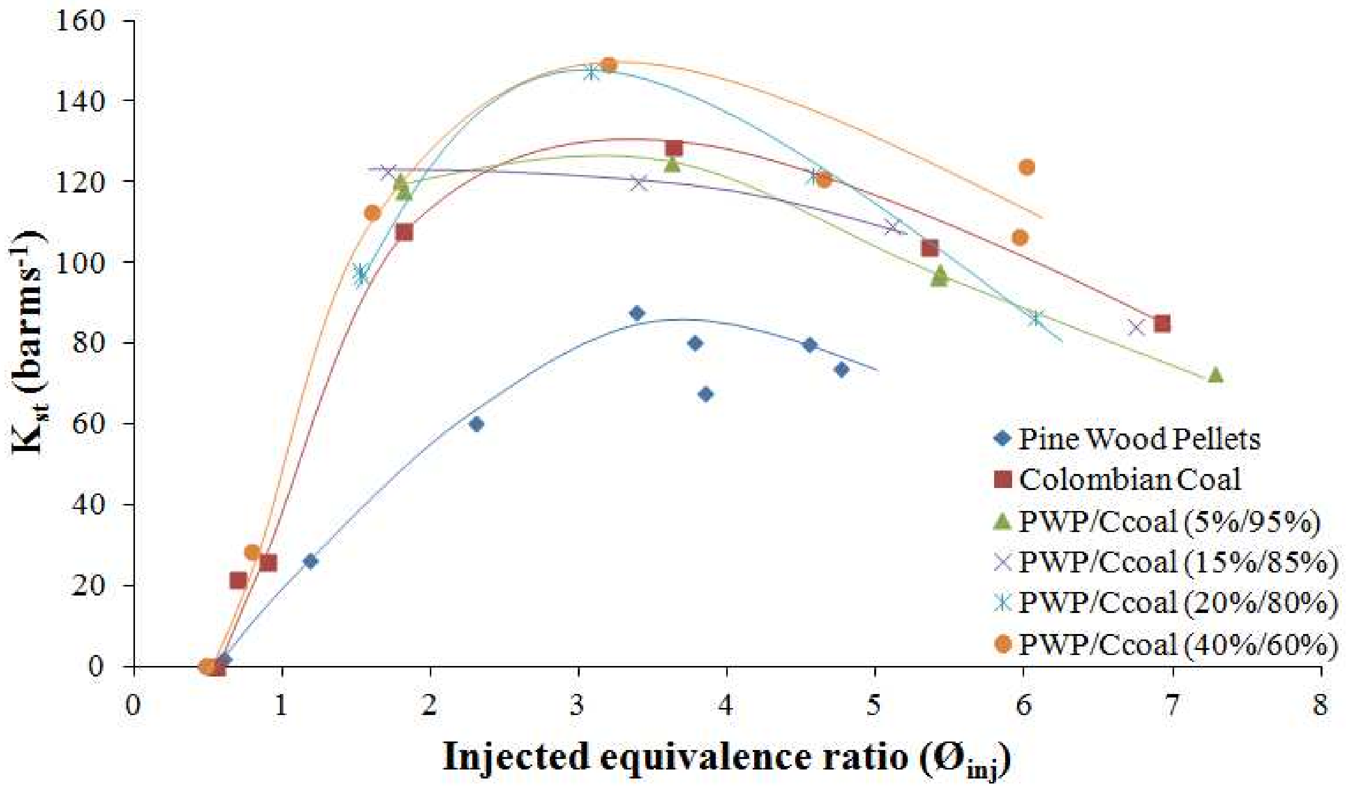

Fig. 1. Kst vs injected equivalence ratio