



UNIVERSITY OF LEEDS

This is a repository copy of *Influence of Biomass Pellet Composition on the Pulverised Pellet Flame Propagation and Minimum Explosion Concentration*.

White Rose Research Online URL for this paper:
<http://eprints.whiterose.ac.uk/89062/>

Version: Accepted Version

Conference or Workshop Item:

Saeed, MA, Andrews, GE, Phylaktou, HN et al. (1 more author) (2015) Influence of Biomass Pellet Composition on the Pulverised Pellet Flame Propagation and Minimum Explosion Concentration. In: 25th International Colloquium on the Dynamics of Explosions and Reactive Systems (ICDERS), 02-07 Aug 2015, Leeds, UK.

Reuse

Unless indicated otherwise, fulltext items are protected by copyright with all rights reserved. The copyright exception in section 29 of the Copyright, Designs and Patents Act 1988 allows the making of a single copy solely for the purpose of non-commercial research or private study within the limits of fair dealing. The publisher or other rights-holder may allow further reproduction and re-use of this version - refer to the White Rose Research Online record for this item. Where records identify the publisher as the copyright holder, users can verify any specific terms of use on the publisher's website.

Takedown

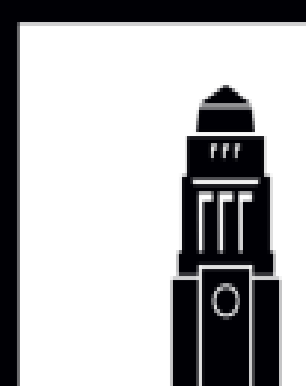
If you consider content in White Rose Research Online to be in breach of UK law, please notify us by emailing eprints@whiterose.ac.uk including the URL of the record and the reason for the withdrawal request.



eprints@whiterose.ac.uk
<https://eprints.whiterose.ac.uk/>

Influence of Biomass Pellet Composition on the Pulverised Pellet Flame Propagation and Minimum Explosion Concentration

Muhammad Azam Saeed, Gordon E. Andrews, Herodotos N. Phylaktou and Bernard M. Gibbs
ERI, SCAPE, University of Leeds, LS2 9JT, United Kingdom.
pmmas@leeds.ac.uk



UNIVERSITY OF LEEDS

Introduction

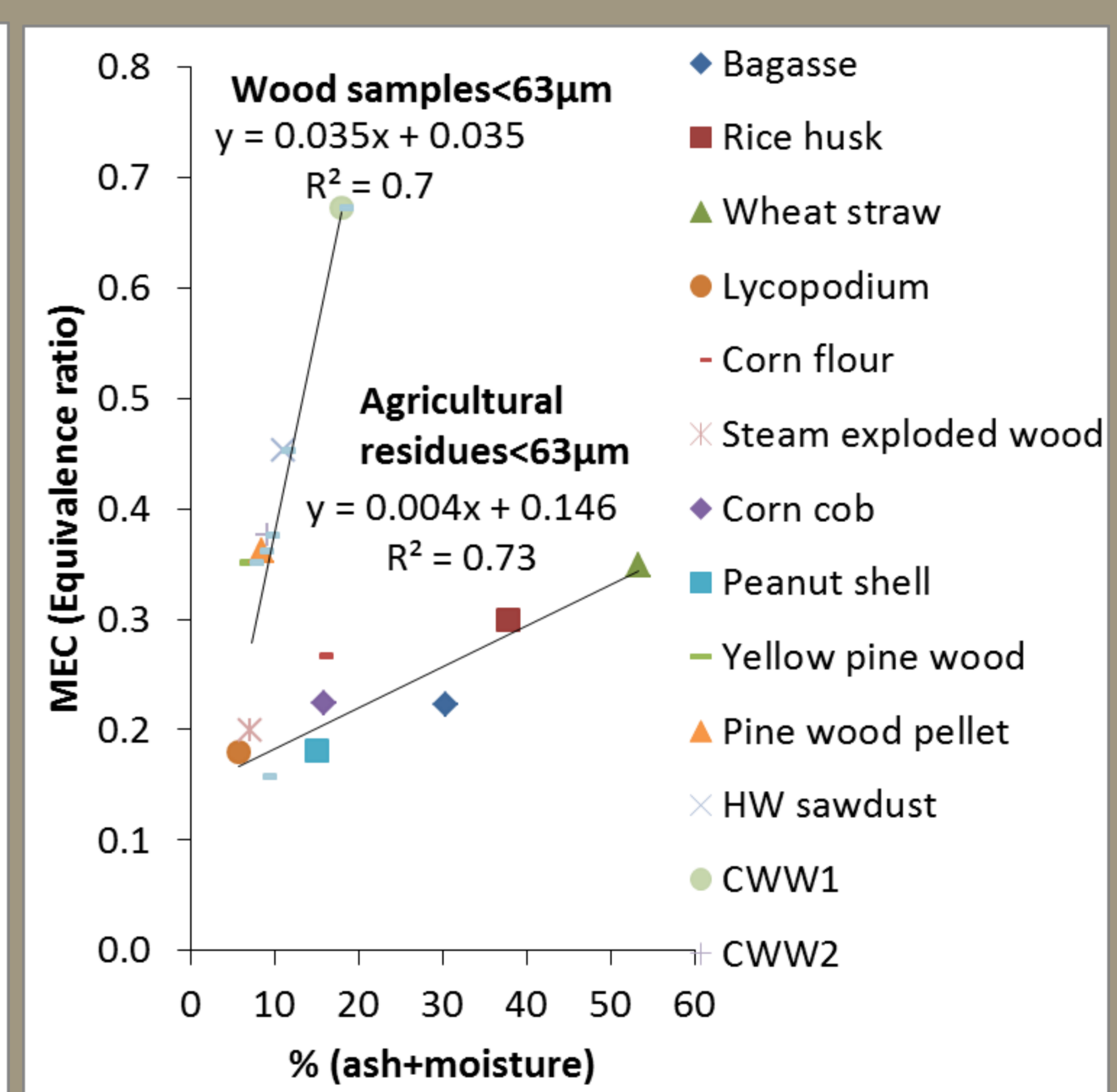
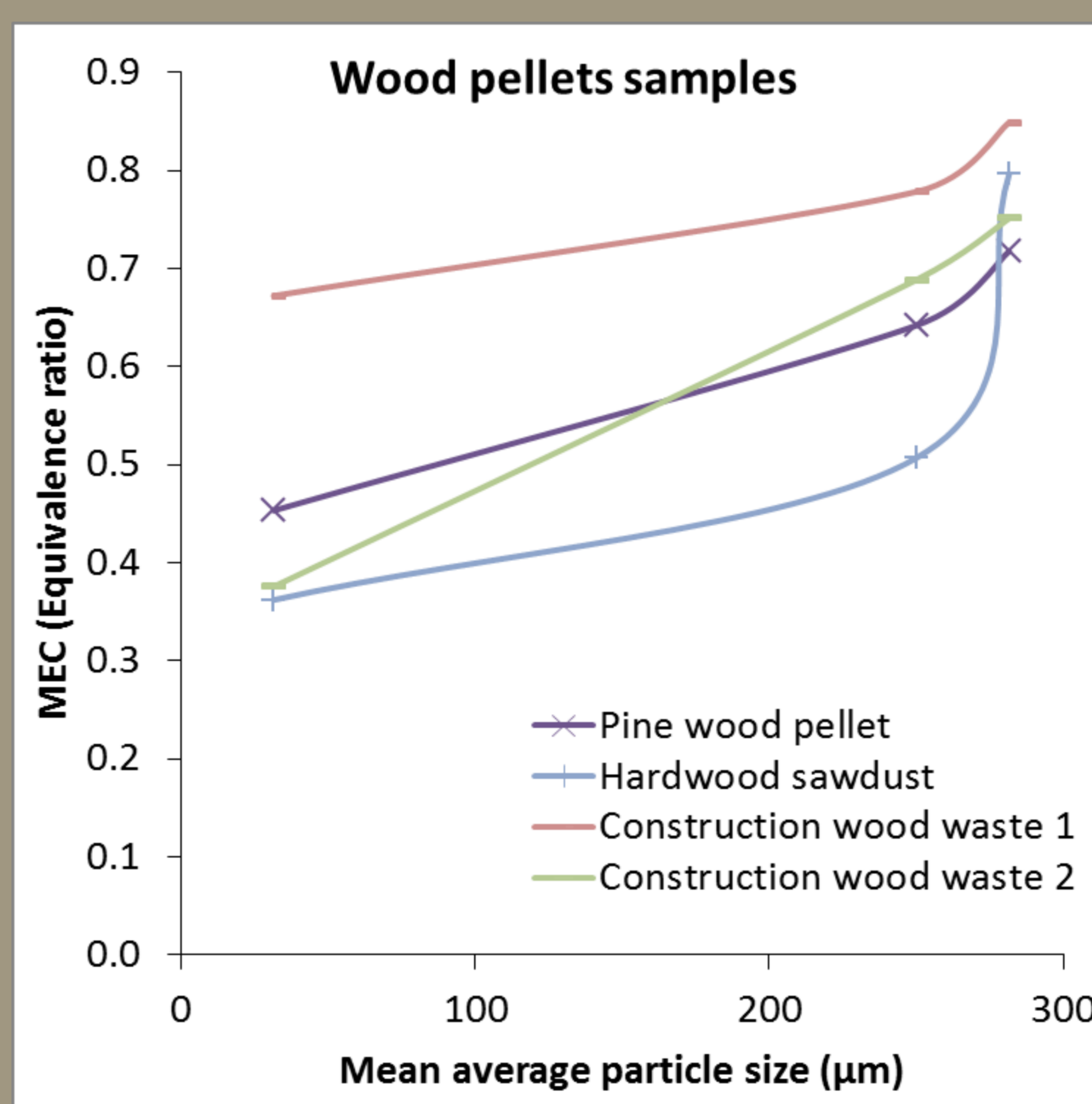
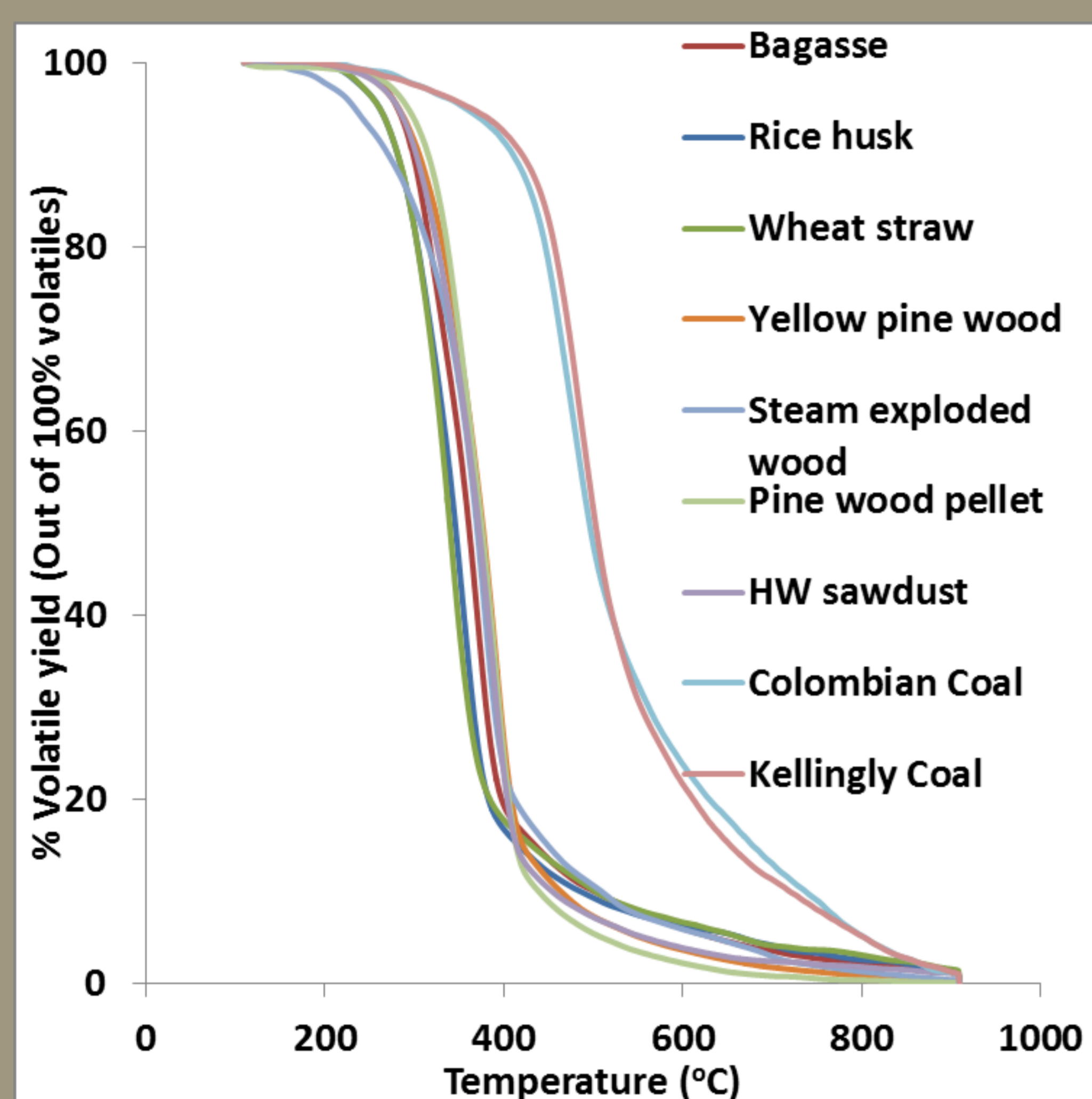
- Biomass is a sustainable and effective solution to CO₂ emission reduction.
- Pelletisation results higher energy density, ease of handling and transportation.
- For efficient combustion pellets need to be pulverised.
- Finer particles of <63μm release more volatiles contributing almost 100% in flame propagation without formation of char.
- Inerts like ash+moisture act to reduce the reactivity that is more severe for wood as compared to crop residues.

Experimental Methodology

- Modified Hartmann dust explosion tube was used for measurements of flame speed and minimum explosive concentration (MEC) [1].
- Dust is pneumatically dispersed with pre-existing spark.
- Pressure transducer and array of thermocouples recorded pressure rise and time of flame arrival (flame speed).



Results



- For biomass samples 90% of the volatiles released at around 450°C in contrast to coals (750°C).
- Fine particles with higher surface area release more volatiles.
- No evidence of char residue left for fine particles of biomass.

- Average particle size of different sized fractions against their respective MEC obtained from modified Hartmann tube.
- Minimum explosible concentration decreases with decreasing particle size.

- Good correlation of %ash+H₂O vs. MEC were obtained for biomass samples.
- % ash+H₂O affect MEC more for wood samples than for crop residues.

Conclusions

- Higher content and rapid release of volatiles, at lower temperatures, makes biomass more reactive than coals.
- Reactivity of biomass increased with decreasing particle size.
- Inerts (ash and moisture) showed a greater effect on MEC for biomass milled pellets than for crop residue.

References

[1] Saeed MA, Medina CH, Andrews GE, Phylaktou HN, Slatter D, Gibbs BM. 2015 Agricultural waste pulverised biomass: MEC and flame speeds. Journal of Loss Prevention in the Process Industries.36:308-17.