Characterization and reactivity of soot from fast pyrolysis of lignocellulosic compounds and monolignols

This study presents the effect of lignocellulosic compounds and monolignols on the yield, nanostructure and reactivity of soot generated at 1250 °C in a drop tube furnace. The structure of soot was characterized by electron microscopy techniques, Raman spectroscopy and electron spin resonance spectroscopy. The CO$_2$ reactivity of soot was investigated by thermogravimetric analysis. Soot from cellulose was more reactive than soot produced from extractives, lignin and monolignols. Soot reactivity was correlated with the separation distances between adjacent graphene layers, as measured using transmission electron microscopy. Particle size, free radical concentration, differences in a degree of curvature and multi-core structures influenced the soot reactivity less than the interlayer separation distances. Soot yield was correlated with the lignin content of the feedstock. The selection of the extraction solvent had a strong influence on the soot reactivity. The Soxhlet extraction of softwood and wheat straw lignin soot using methanol decreased the soot reactivity, whereas acetone extraction had only a modest effect.

General information
State: Published
Organisations: Center for Electron Nanoscopy, Luleå University of Technology, Umeå University, Worcester Polytechnic Institute, University of Copenhagen
Pages: 1489-1500
Publication date: 2018
Peer-reviewed: Yes

Publication information
Journal: Applied Energy
Volume: 212
ISSN (Print): 0306-2619
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 8.44 SJR 3.162 SNIP 2.765
Web of Science (2017): Impact factor 7.9
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 7.78 SJR 3.011 SNIP 2.61
Web of Science (2016): Impact factor 7.182
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 6.4 SJR 2.835 SNIP 2.593
Web of Science (2015): Impact factor 5.746
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 6.93 SJR 3.158 SNIP 3.218
Web of Science (2014): Impact factor 5.613
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 6.59 SJR 3.06 SNIP 3.346
Web of Science (2013): Impact factor 5.261
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 5.69 SJR 2.778 SNIP 3.076
Web of Science (2012): Impact factor 4.781
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1