



Beneficiation from Coal Washing Tailings and Biomass in Active Carbon and Humate mud production

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Abstract

Pyrolysis and processing biomass with coal may provide active carbon source. Tailings of coal washing plants contained coal source for active carbon production and agricultural biomass wastes could be mixed together with this tailings providing sufficient active carbon char quality for organic fertility of soil remediation. 27% relatively more fertile humate production could be managed by active carbon mix of coal washing tailings to soil.

Keywords: Coal Washing Tailings, Biomass, Active Carbon, Humate mud.

1. INTRODUCTION

The production of the derived fuels from biomass is desirable for a several reasons, such as the clean gaseous and oils products and economical side of transportation and marketing of supply and environmental considerations. Renewable alternatives for fossil fuels are the biomass and the derivatives of biomass to a wide variety of resources with various properties. The improved technology to convert various biomass wastes or resources into a preferable product is therefore very significant.

The heat values of biomass potentially recycled in the world for a renewable source bring out necessity in use by mixing or a self preference on combustion biomass wastes in the country. The total thermal values based on the products for maize, wheat and cotton are 33.4, %16.1% and 27.6%, respectively. In Table 1, the total annual production of horticultural crops in Turkey is given. The total thermal values are approximately 13,5, 14,8 and 21.5 kJ/kg, respectively. As given in Table the total calorific value of the product nut shells and olive seed were 56.3% and 25.2%. The potential calorific value of the potential amount of pitch waste and animal waste could be determined and true and theoretical values of heat for cows, sheep and poultry, which is about 36, 13 and 6.5 million tons/a in Turkey for cows. According to the number of animals in Şırnak City Province, sheep and poultry, and approximately in Şırnak City Province these amounts of annual waste capacity are 235, 141, 58 thousand tons/a, respectively. The total annual amount of forest, bush and wood waste, are 6, 0.6 and 0.49 million tones, respectively in Turkey. The total available solids content of forest, bush and wood waste are recycled 65%, 3% and 99% as determined by the availability, respectively .

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Table I. Biomass Statistics of Turkey of 2013-2014 [1].

	Theoretical	Actual	Theoretical	Actual
	Million ton			
Forest Waste Wood, (Log, Bush)	12.4	6.4	17.1	7.6
Agricultural Waste Maize Slush	14.5	1.3	19.1	1.4
Municipal Waste (Cardboard)	2.5	0.4	3.4	0.4
Average Animal Manure	11.4	2.3	11.8	2.4

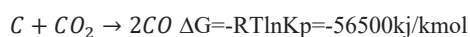
2. PYROLYSIS OF AGE LAYOUT

The torrefaction and advanced applications for active carbon require further treatment. The pyrolysis process can thus be regarded as pre-treatment process. Pre-treatment of biomass via pyrolysis results in various advantages compared to the direct utilization of biomass. The energy density on volumetric basis is a factor 3–10 higher for pyrolysis oil, decreasing e.g. transportation costs. Via pyrolysis, locally available biomass streams can be exploited as renewable material which could otherwise not be processed economically. Besides economic and ecologic advantages, pre-treatment via pyrolysis also creates technical advantages. The pyrolysis oil is much easier and cheaper than char, solid carbon mass. Also, ash forming elements are reduced by an order of magnitude. The decision to include fast pyrolysis as pre-treatment or gasify the powdered biomass in an entrained flow gasifier directly will ultimately depend on biomass properties and the specific scenario.

2.1. Coal Pyrolysis for Char

One of the most common method to convert biomass into biofuels is believed to be pyrolysis and entrained flow gasification. Pyrolysis of biomass has been studied extensively and several reactor technology have used at commercial scale. In the fast pyrolysis process, biomass is rapidly heated in an oxygen free environment to form condensable vapours, permanent gases and a solid residue often referred to as char. After rapid cooling of the condensable vapours, up to 700g/kg of biomass can be converted into a liquid product called pyrolysis oil. With comparable heating values, the overall energy yield from biomass to pyrolysis oil is in the same range (0.7J/biomassJ).

A slightly different approach is followed in the pyrolysis cracking of fast reactions and the following oxidation of carbon matter with oxygen and steam forming process,



3. METHOD

The chemical analysis of fuel resources used in the experimentation are given in Table I.

Table I. Coal and Biomass feedstock properties

	Pinewood waste	Maize slush	Şirnak Asphaltite
Moisture (a.d.)	98	68	(g/kg)
Ash (dried)	34	24	(g/kg)
LHV (a.d.)	18.8	14.2	(MJ/kg)
Elements (Dried)			
C	515	437	(g/kg)
H	63.0	57.5	(g/kg)
N	<0.1	8.9	(g/kg)
O	419	433	(g/kg)
S	62	894	(mg/kg)
P	59	695	(mg/kg)
Ni	0.9	1.2	(mg/kg)
Pb	1.5	<1	(mg/kg)
Mn	96	19	(mg/kg)
Ca	1143	2223	(mg/kg)
Mg	222	488	(mg/kg)
Fe	149	66	(mg/kg)
Na	18	62	(mg/kg)
Al	117	35	(mg/kg)
K	465	11,850	(mg/kg)
Zn	11	10	(mg/kg)

The moisture content of wheat straw before pyrolysis was relatively high at 98g/kg. Comparing the wood and straw shows a significantly higher ash content in the wood waste.

In Figure 1 photographs of the laboratory equipment used in this work are presented. The produced pyrolysis oil and the asphaltite feed was integrated with the control system in the gasifier.

4. CONCLUSIONS

The pyrolysis products can be used as humate mud as char from a biomass and coal mixture feed in pyrolysis and steam gasification. This approach can have certain advantages over direct biomass gasification. The tests were performed to investigate the methanation of syngas from biomass via the pyrolysis and entrained flow gasification to syngas. The maize slush, forestry waste pine wood were used as feedstocks; both were converted into homogeneous pyrolysis oils and syngas with very similar gasification and hydrogenation of steam gas. were measured for waste pine wood waste- and waste maize slush derived pyrolysis syngas, respectively. A continuous 2-day gasification run with wood derived pyrolysis syngas was under full steady state operation.

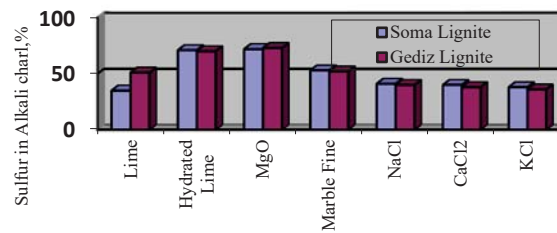


Fig. 1. Sulfur converted in alkali char and char properties

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