

Utilization of bio-mass ashes

(project QI102A207/2009)



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Wastes and following problems



- Czech Republic: more than 90 biomass heat stations (more than 2 MW)
 - 40,000t of wastes per year in 2010
 - **70,000t of wastes per year in 2011**
- High pH value of water extract $\text{pH} > 11$
- Necessity of special deposition
- Increasing of operating and heat costs

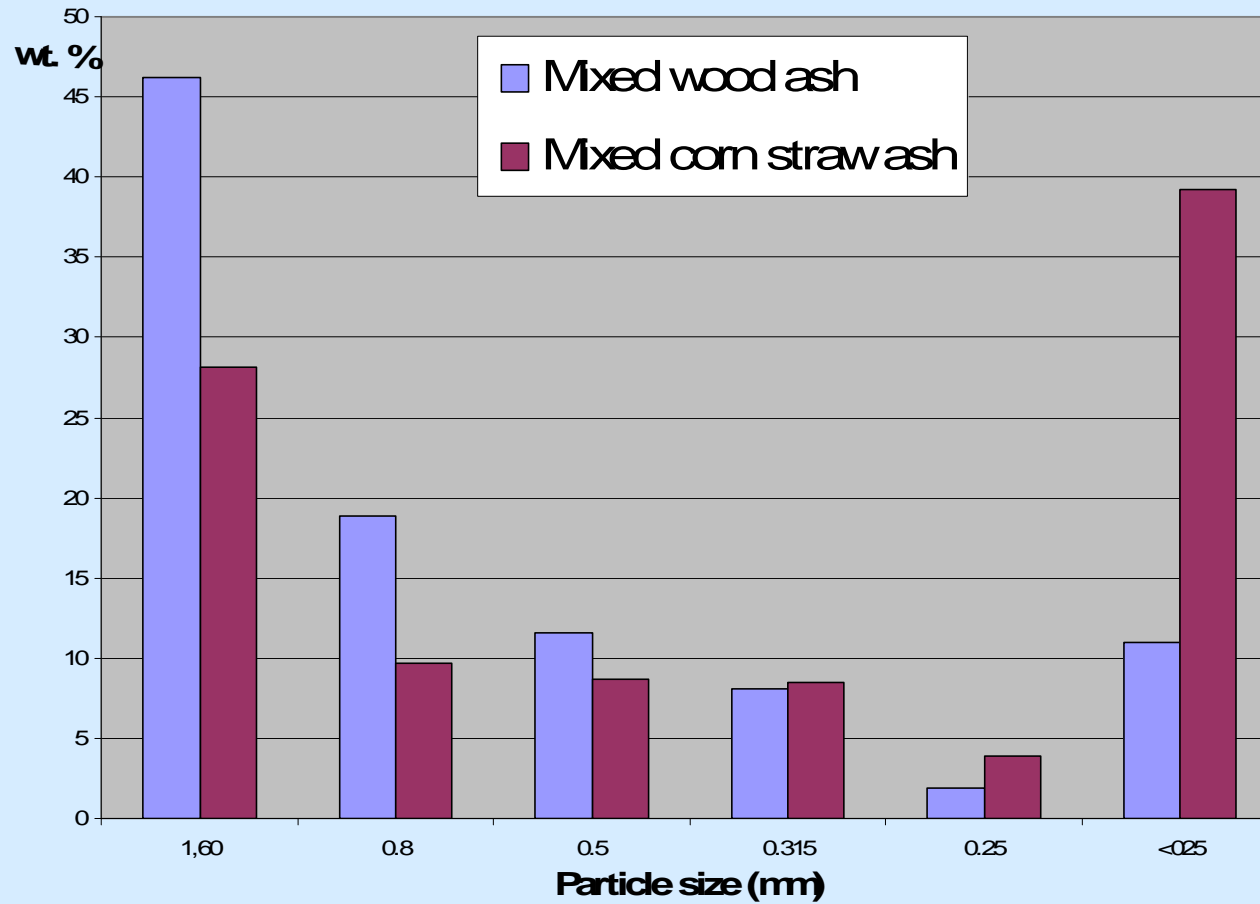
Chemical composition



Chemical composition of cinders from bio-masses (wt. %)

Material/ Oxide (wt.%)	SiO ₂	Al ₂ O ₃	CaO	SO ₃	K ₂ O	Fe ₂ O ₃	LOI
Wooden cinder	56.12	10.59	14.17	0.06	5.55	8.47	0.1
Corn straw cinder	56.54	2.43	7.89	0.30	19.06	1.50	5.30

Particle size analyses



XRD analyses of bio-mass ashes



Mixed wood ash

- Calcite (CaCO_3)
- Periclase (MgO)
- Portlandite (Ca(OH)_2)
- Magnetite (Fe_3O_4)
- Quartz (SiO_2)
- Lime (CaO)
- Arcanite (K_2SO_4)

Mixed corn straw ash

- Quartz (SiO_2)
- Sylvite (KCl)
- Cristobalite (SiO_2)
- Magnesite (MgCO_3)
- Arcanite (K_2SO_4)
- Calcite (CaCO_3)
- Lazulite ($\text{MgAl}_2(\text{PO}_4)_2(\text{OH})_2$)

Utilization



1. Fertilizer (project – QI102A207/2009)
2. Additive to geopolymer matrix
3. Sliding material to abrasives

1. Fertilizer (project QI102A207/2009)



Tasks:

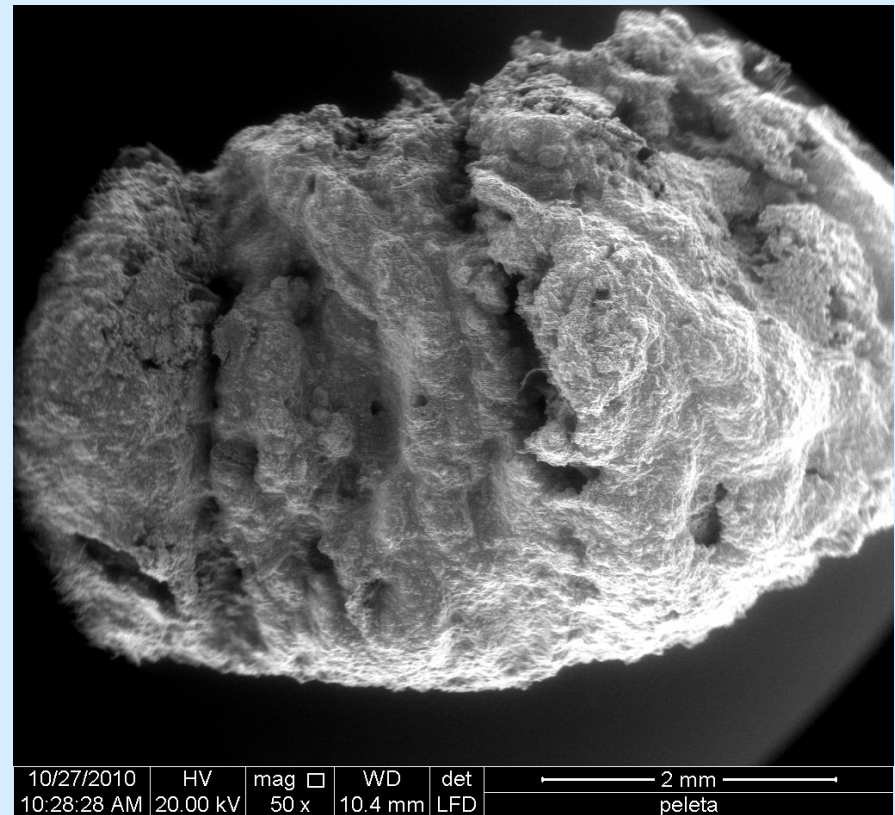
- Fine particles - necessity of pelletization
- High pH value of water extract $\text{pH} > 11$ – necessity of gradual dissolution
- Simple preparation

Pellets



Microscopy view on pellet

- Bio ~~mass~~ ash binding by nature friendly organic material
- Tested by Czech University of Life Sciences in Prague:
 - Analyses of organic substances in biomass ashes
 - Pot experiments with addition of pellets



2. Additive to geopolymer matrix: Multipurpose composite



→ Paper layer – for final decoration of inner wall

→ Foamed layer – heat and acoustic insulating function

→ First supporting layer – geopolymer with addition of bio- mass ash and wood waste material

→ Polystyrene layer – heat insulation of material protected from both sides against fire

→ Second supporting layer – geopolymer with addition of bio-mass ash and wood waste material

3. Sliding material to abrasives



- Matrix: mixture of industrially prepared primary clay material and blast furnace slag (1 : 1.8)
- Abrasives: brown corundum F36 (26 wt.%)
- Sliding material: corn straw ash (5 wt.%)



Semi-industrial grinding: Grinding stones fixed in holder

Conclusion



- The present results showed very good possibility of bio-mass ashes utilization as fertilizer.
- Ashes from bio-mass burning are limited as main geopolymer material for their rather low alumina content but they are very perspective additive materials.
- We proved a possibility to use biomass ashes as sliding material in abrasives.

Thank you for your attention



Acknowledgement:

- This work is supported by Scientific Research Plan No.: AVOZ 30460519 of the Institute of Rock Structure and Mechanics approved by Czech Academy of Sciences and by the Ministry of Agriculture of the Czech Republic through the project QI102A207/2009.