Project BioCrete

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Some results of the analysis of bio ash quality

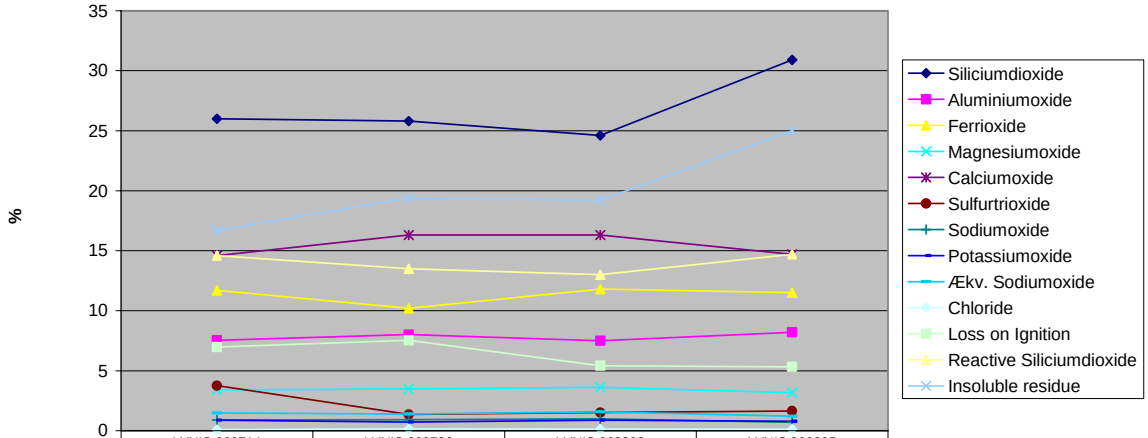
Based on the chemical analysis according to EN 450-1 and analysis by WDXRF of 8 samples of bio ash (4 from each WWTP) the following can be concluded:

- Among the main components (present in amounts larger than 0.5-1.0%) the composition seems to be fairly constant. However, some variation is observed for sulfur trioxide. The variation in composition seems to be somewhat higher for the LYNIS bio ash than for the AWS bio ash, see figure 1-4.

- Among the minor elements including the heavy metal the composition seems relatively constant between samples. Rarely is the standard deviation above 15% of the average.

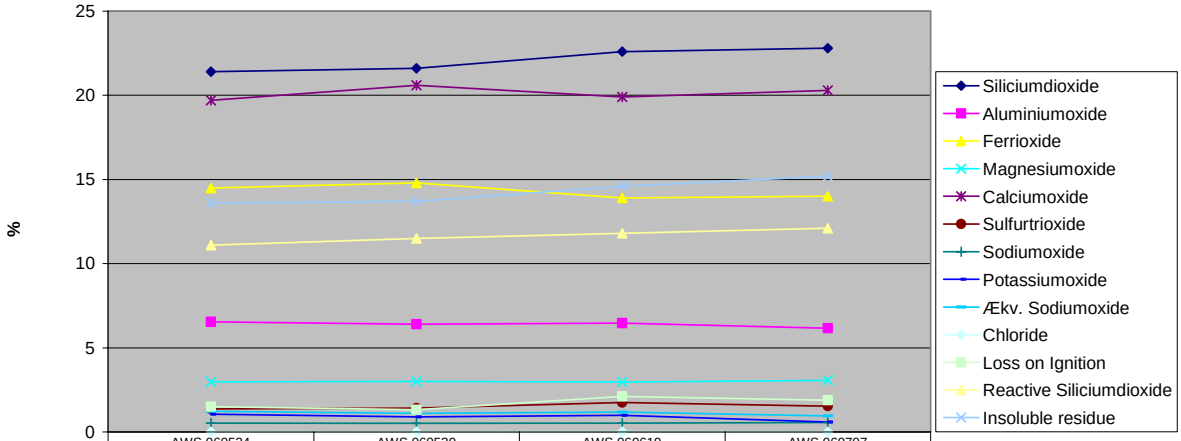
- The mineralogical composition of the ashes revealed similar compositions. However, LYNIS bio ashes contain more amorphous phase and quartz, but less hematite and calcium phosphate than AWS bio ashes. The amorphous content of the ashes are found to be in the range of 50-70%, which appears to be a rather high amount considering the composition and combustion history of the ashes. More investigation into the structure of the phase characterised as amorphous by QXRD is needed.

Figure 1. LYNIS bio ash. Main components according to EN 450-1



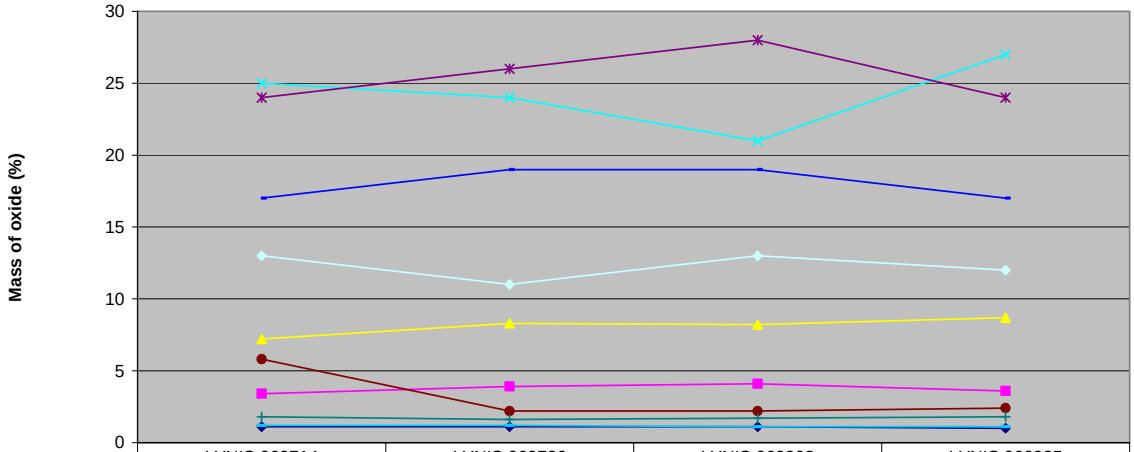
	LYNIS 060714	LYNIS 060726	LYNIS 060808	LYNIS 060825
Siliciumdioxide	26	25,8	24,6	30,9
Aluminiumoxide	7,53	8,02	7,51	8,21
Ferrioxide	11,7	10,2	11,8	11,5
Magnesiumoxide	3,41	3,48	3,62	3,17
Calciumoxide	14,6	16,3	16,3	14,7
Sulfurtrioxide	3,76	1,36	1,51	1,64
Sodiumoxide	0,9	0,91	0,99	0,7
Potassiumoxide	0,88	0,73	0,89	0,79
Ækv. Sodiumoxide	1,48	1,39	1,57	1,22
Chloride	0,082	0,16	0,15	0,12
Loss on Ignition	6,97	7,53	5,41	5,33
Reactive Siliciumdioxide	14,6	13,5	13	14,7
Insoluble residue	16,7	19,4	19,2	25

Figure 2. AWS bio ash. Main components according to EN 450-1



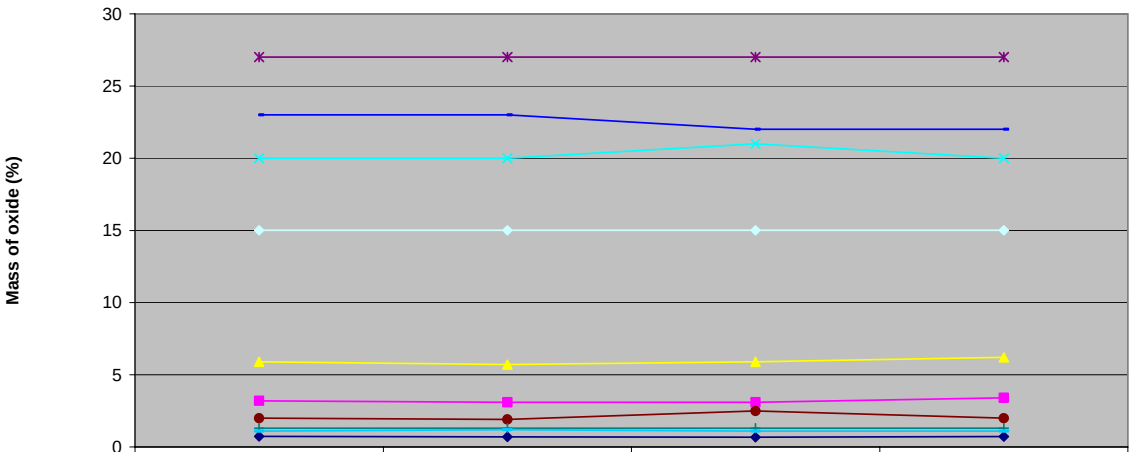
	AWS 060524	AWS 060530	AWS 060619	AWS 060707
Siliciumdioxide	21,4	21,6	22,6	22,8
Aluminiumoxide	6,54	6,4	6,47	6,16
Ferrioxide	14,5	14,8	13,9	14
Magnesiumoxide	2,98	3,01	2,97	3,07
Calciumoxide	19,7	20,6	19,9	20,3
Sulfurtrioxide	1,37	1,42	1,75	1,54
Sodiumoxide	0,53	0,52	0,53	0,56
Potassiumoxide	1,06	0,89	0,99	0,59
Ækv. Sodiumoxide	1,23	1,11	1,18	0,96
Chloride	0,014	0,008	0,021	0,016
Loss on Ignition	1,51	1,32	2,12	1,89
Reactive Siliciumdioxide	11,1	11,5	11,8	12,1
Insoluble residue	13,6	13,7	14,6	15,2

Figure 3. LYNIS bio ash. Main oxide components determined by WDXRF



	LYNIS 060714	LYNIS 060726	LYNIS 060808	LYNIS 060825
Na2O	1,1	1,1	1,1	1
MgO	3,4	3,9	4,1	3,6
Al2O3	7,2	8,3	8,2	8,7
SiO2	25	24	21	27
P2O5	24	26	28	24
SO3	5,8	2,2	2,2	2,4
K2O	1,8	1,6	1,7	1,8
CaO	17	19	19	17
TiO2	1,2	1,2	1,1	1,1
Fe2O3	13	11	13	12

Figure 4. AWS bio ash. Main oxide components determined by WDXRF



	AWS 060524	AWS 060530	AWS 060619	AWS 060707
Na2O	0,74	0,7	0,68	0,72
MgO	3,2	3,1	3,1	3,4
Al2O3	5,9	5,7	5,9	6,2
SiO2	20	20	21	20
P2O5	27	27	27	27
SO3	2	1,9	2,5	2
K2O	1,3	1,3	1,3	1,3
CaO	23	23	22	22
TiO2	1,1	1,2	1,1	1,1
Fe2O3	15	15	15	15