



Gas generation in incinerator ash

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WASCON 2006

Problem



Explosions during ash handling

Gas generation in incinerator ash

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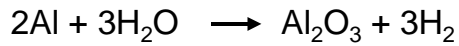
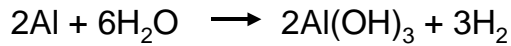
Explosions during ash handling

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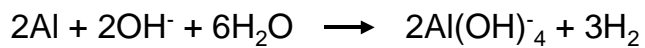
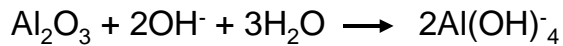
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Chemical reactions

Reaction between elemental aluminium and water



Reaction between aluminium oxide and hydroxide ions



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Purpose of this study

- Are there other reactive metals in addition to aluminium?
- Can elemental aluminium remain in the incinerator ash? How?
- Is there a connection between hydrogen generation and type of fuel, incinerator type and ash fraction?

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Materials

33 ash materials

- fuel
- incinerator type
- ash fraction



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Methods

- Hydrogen generation in the ash materials
- Total content analysis
- SEM/EDS and XRD of aluminium particles (some ash)
- Hydrogen generation in different metal pieces

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Methods, cont.

Hydrogen generation measurements

- ash + NaOH in gas-tight bottle
- magnetic stirrer
- glass syringe after 72 hours
-
- ash + de-ionised water



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Results

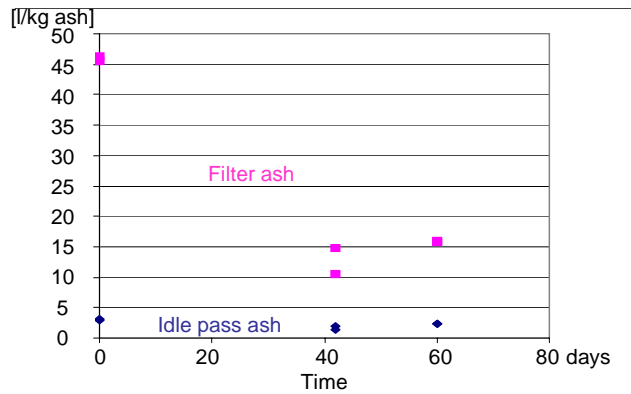
- Besides aluminium, only iron generated hydrogen.
- Weak connection between total aluminium content and hydrogen generation potential.
- Yes, aluminium particles could pass without melting or oxidation.
- Filter ash stored in oxygen rich environment generated less hydrogen than fresh filter ash.

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Results, effect of oxidation

Hydrogen generation potential

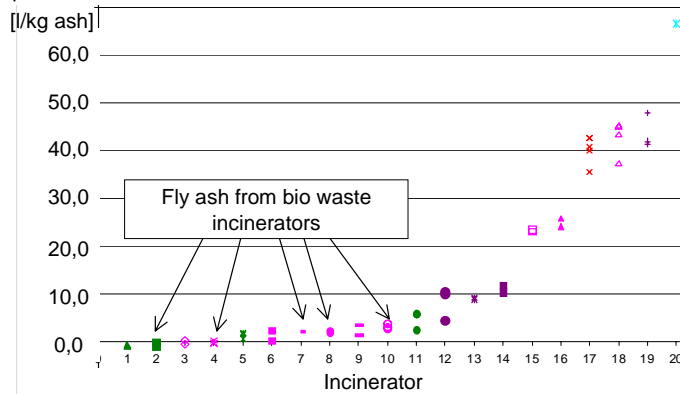


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Results, impact of fuel

Hydrogen generation potential



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Results, impact of boiler type and ash fraction

Fluidised beds:
the filter ash had the largest hydrogen generation potential.

Grate fired boilers:
the bottom ash had the largest hydrogen generation potential.

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Conclusions

- Aluminium dominates
- Aluminium particles survive incineration
- Total aluminium content is not sufficient
- Hydrogen generation potential depends on fuel, incinerator type and ash fraction
- Knowledge of maximum amount of hydrogen + future conditions is necessary

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Recommendations

- Analyse the Content of elemental aluminium or the Hydrogen generation potential!
- Separate metal from the fuel – also non-magnetic metal!
- Arrange for good ventilation around the ash after wetting and Store in oxygen rich environment!

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