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Material Distribution in Treated MSWI Bottom Ash Fractions

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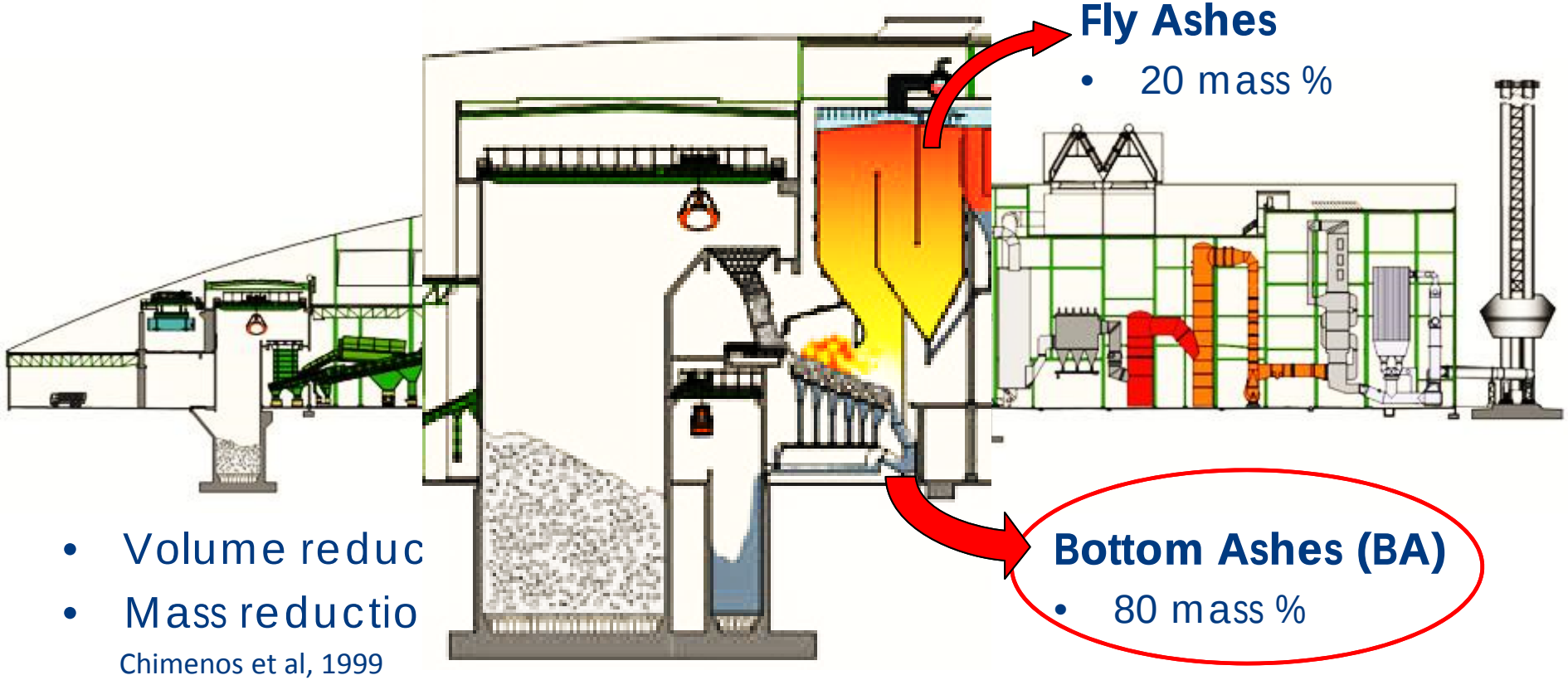
Where innovation starts

Content

- Introduction
  - Municipal Solid Waste Incineration Bottom Ashes (MSWI BA)
  - Dutch legislation
- Methodology
- Results
- Conclusion

Municipal Solid Waste Incineration (MSWI)

Delivery | Pre-treatment | Incineration/ Steam generator | Waste gas cleaning | Chimney



Fly Ashes

- 20 mass %

Bottom Ashes (BA)

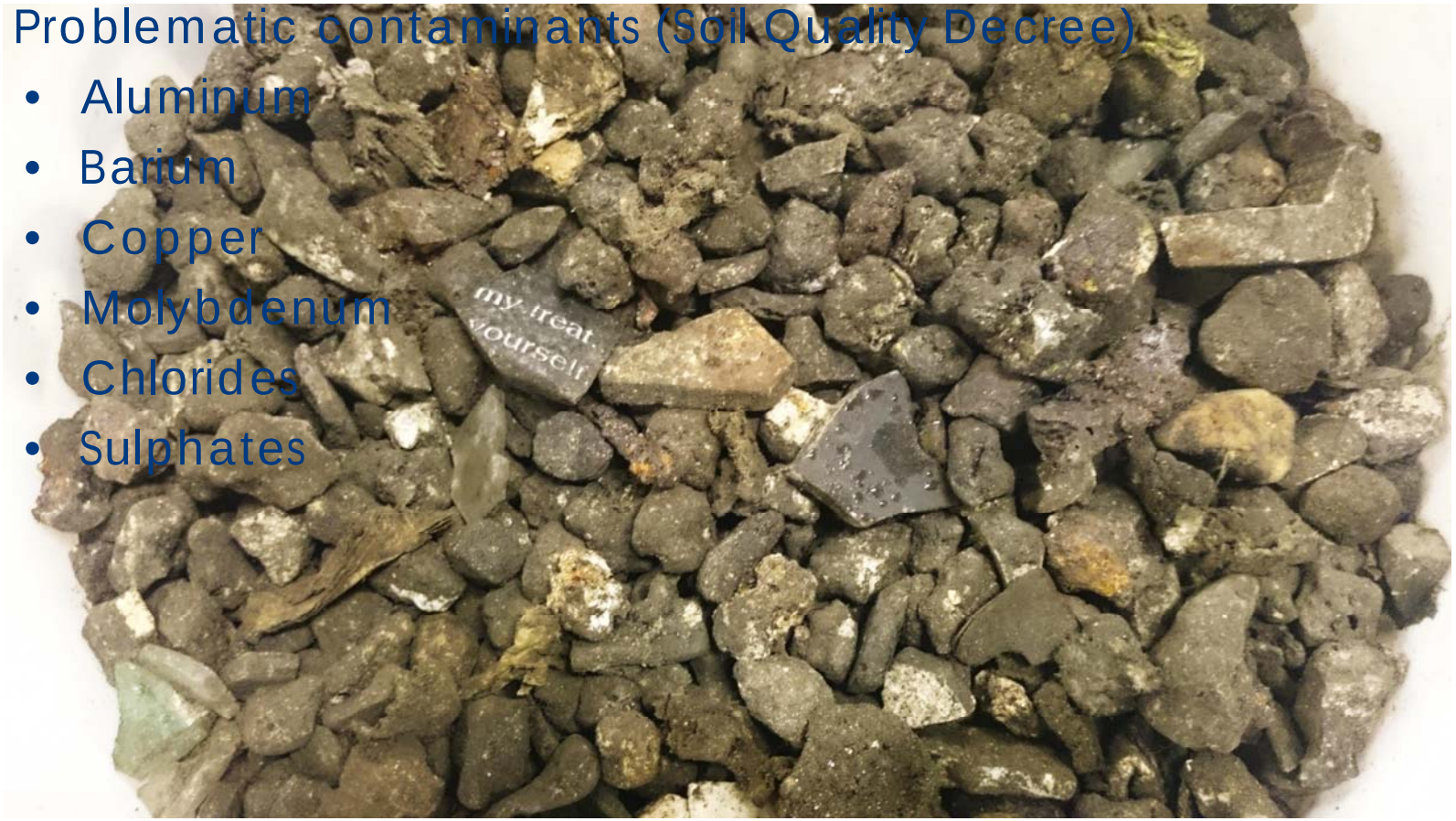
- 80 mass %

- Volume reduc
- Mass reductio

Chimenos et al, 1999

Municipal Solid Waste Incineration Bottom Ash (MSWI BA)

- After pre-treatment
- Problematic contaminants (Soil Quality Decree)
  - Aluminum
  - Barium
  - Copper
  - Molybdenum
  - Chlorides
  - Sulphates



Dutch building material legislation

- Shaped
  - > 50 cm^3
  - Virtually no erosion or wear

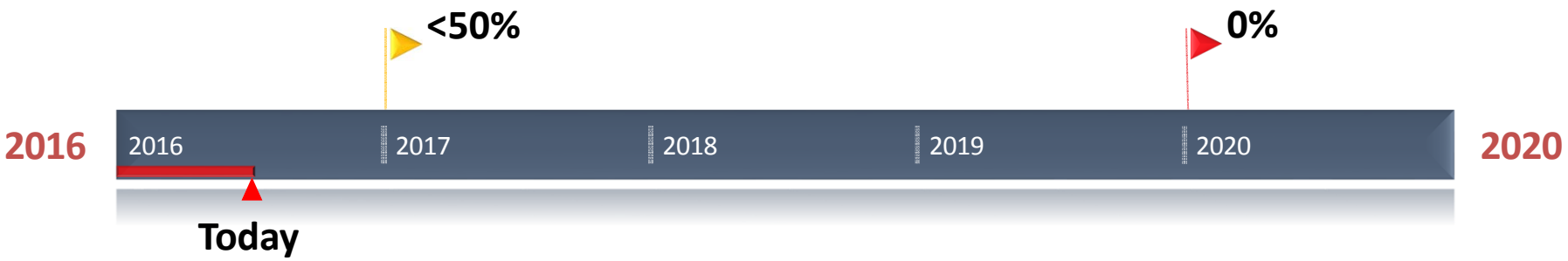


- Unshaped
  - < 50 cm^3
  - Not sustainable rigid
  - Limited emission to the environment

- Isolated, controlled & monitored materials
  - Unshaped building materials
  - High emissions to the environment

Changing Dutch legislation: Green deal

- Isolated, controlled & monitored materials



- 2020: 100% freely applicable building material
  - Shaped
  - Unshaped
  - ~~Isolated, controlled & monitored materials~~

Municipal Solid Waste Incineration Bottom Ash (MSWI BA)

- Alternative applications are needed:
  - Vast production quantities,
  - Limited application as a road base material (Netherlands),
  - Landfilling taxes,
  - Stricter legislation.

- BA has comparable properties to those of raw materials applied in building materials

- BA has the potential to be modified to fit this application.

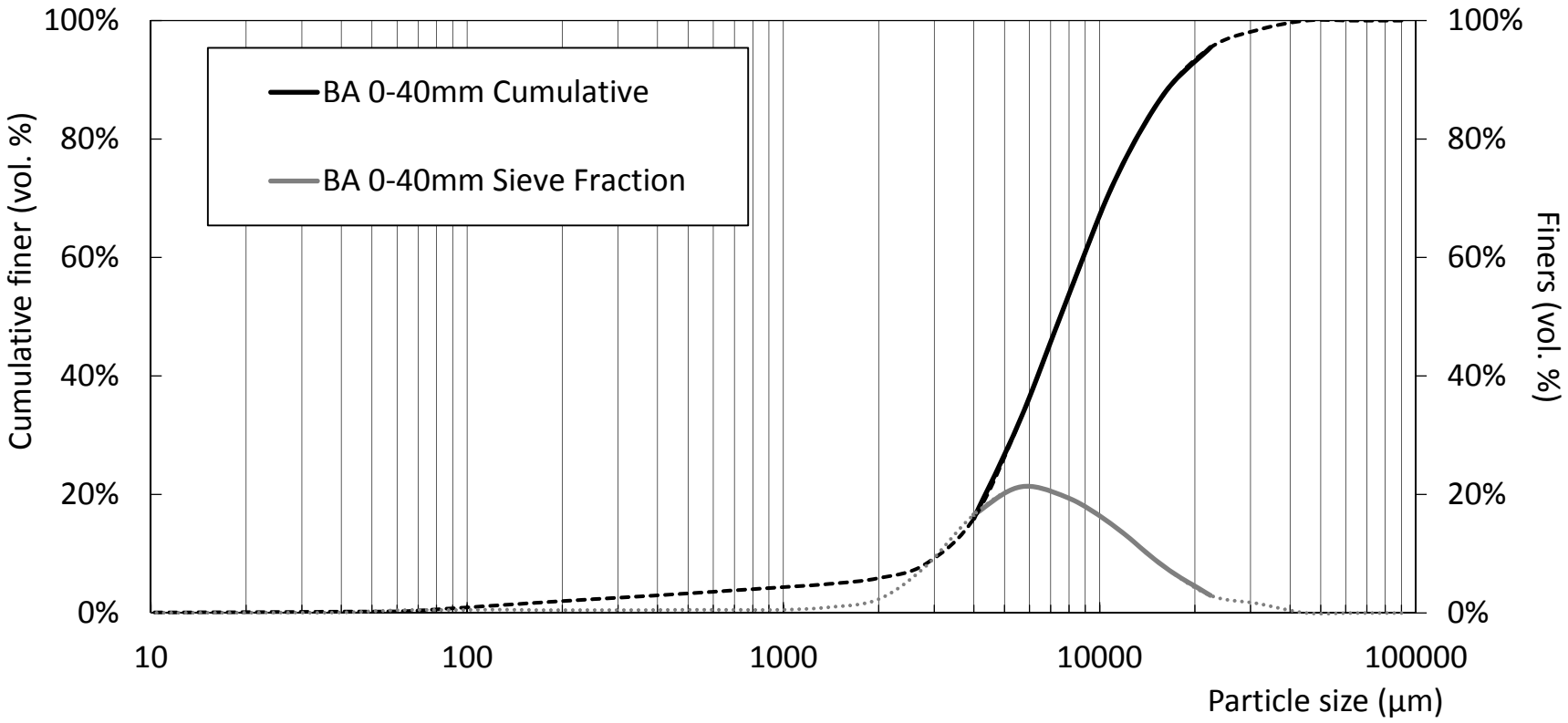
Al-Rawas et al. 2005; Bertolini et al. 2004; Saikia et al. 2008; del Valle-Zermeño et al. 2013; Florea 2016; Su et al. 2013; Yang, Liao, and Wu 2012

Methodology

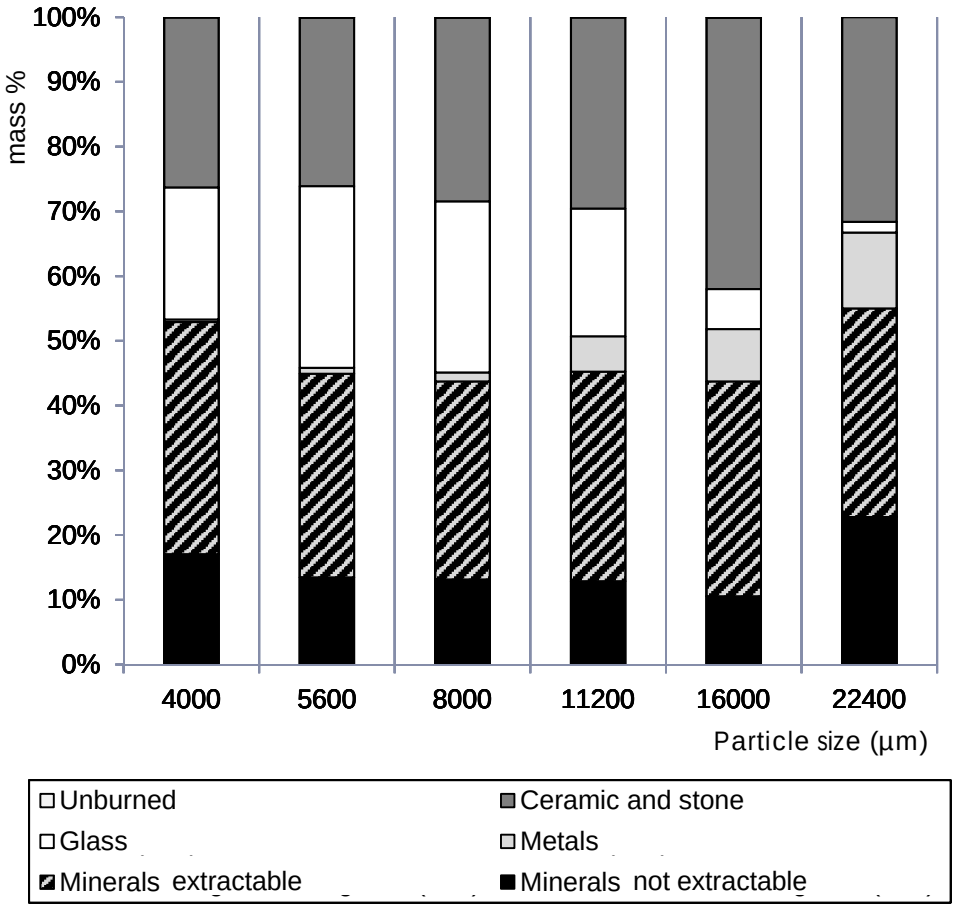
- Particle Size Distribution
  - Dry sieving
- Manually sorting fractions
  - Based on appearance
- Specific density
  - He pycnometer
- Water permeable porosity
  - Hydrostatic weighing

Results

- Particle size distribution MSWI BA 0-40 mm



MSWI BA fractions >4 mm



Glass

Ceramic & Stone

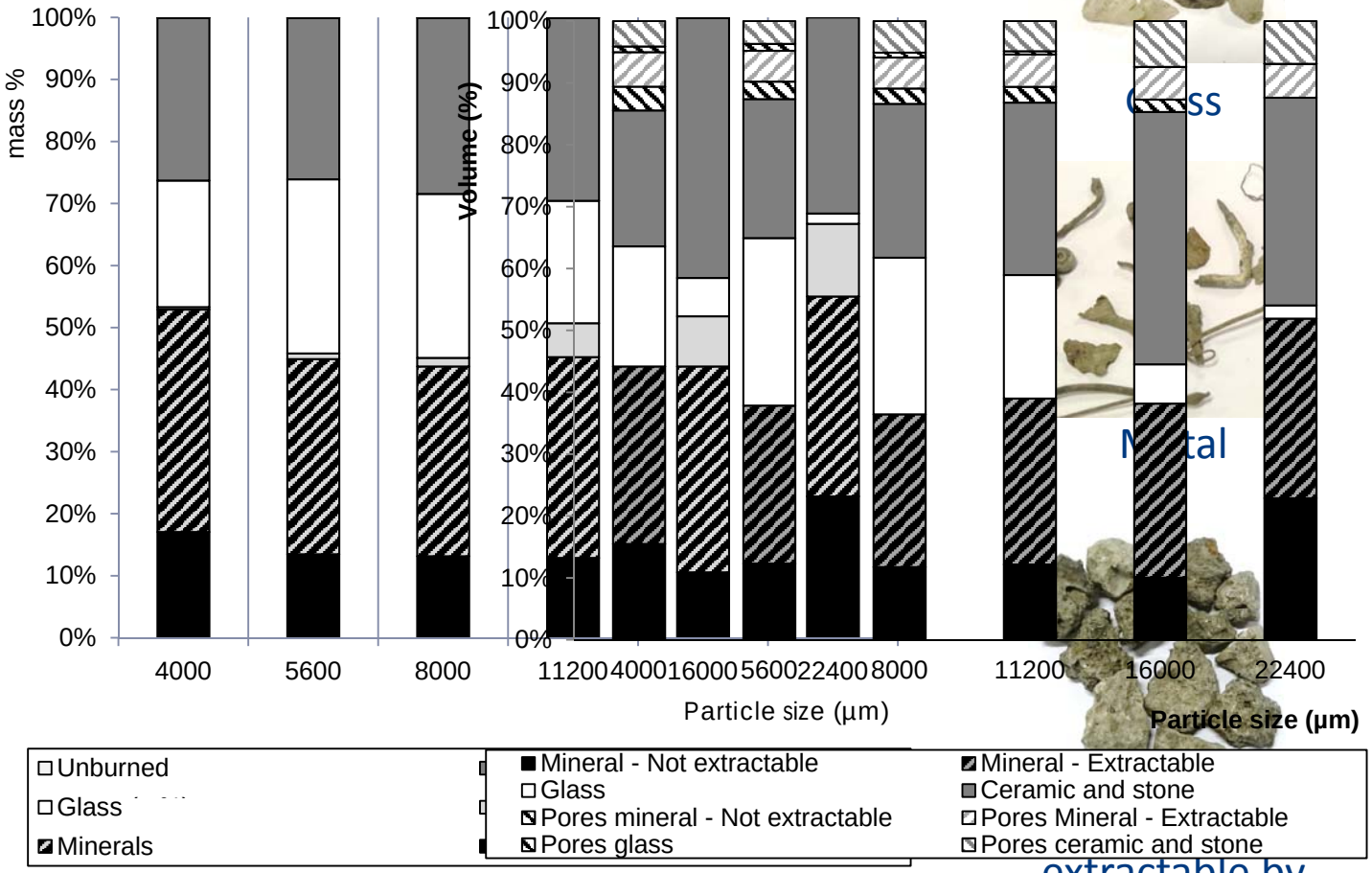
Metal

Unburned

Minerals not extractable by magnet

Minerals extractable by magnet

MSWI BA fractions >4 mm: porosity

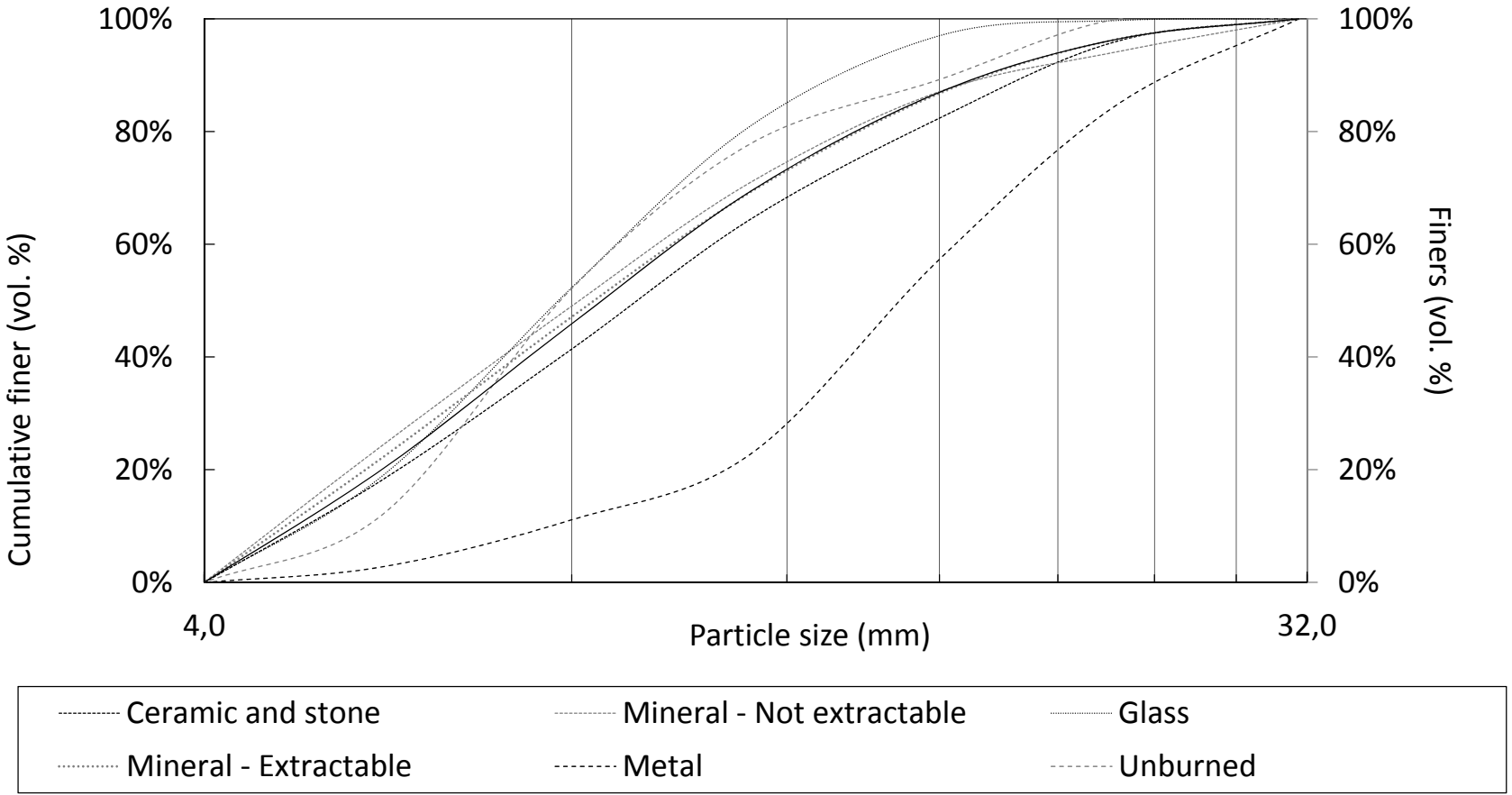


Ceramic & Stone

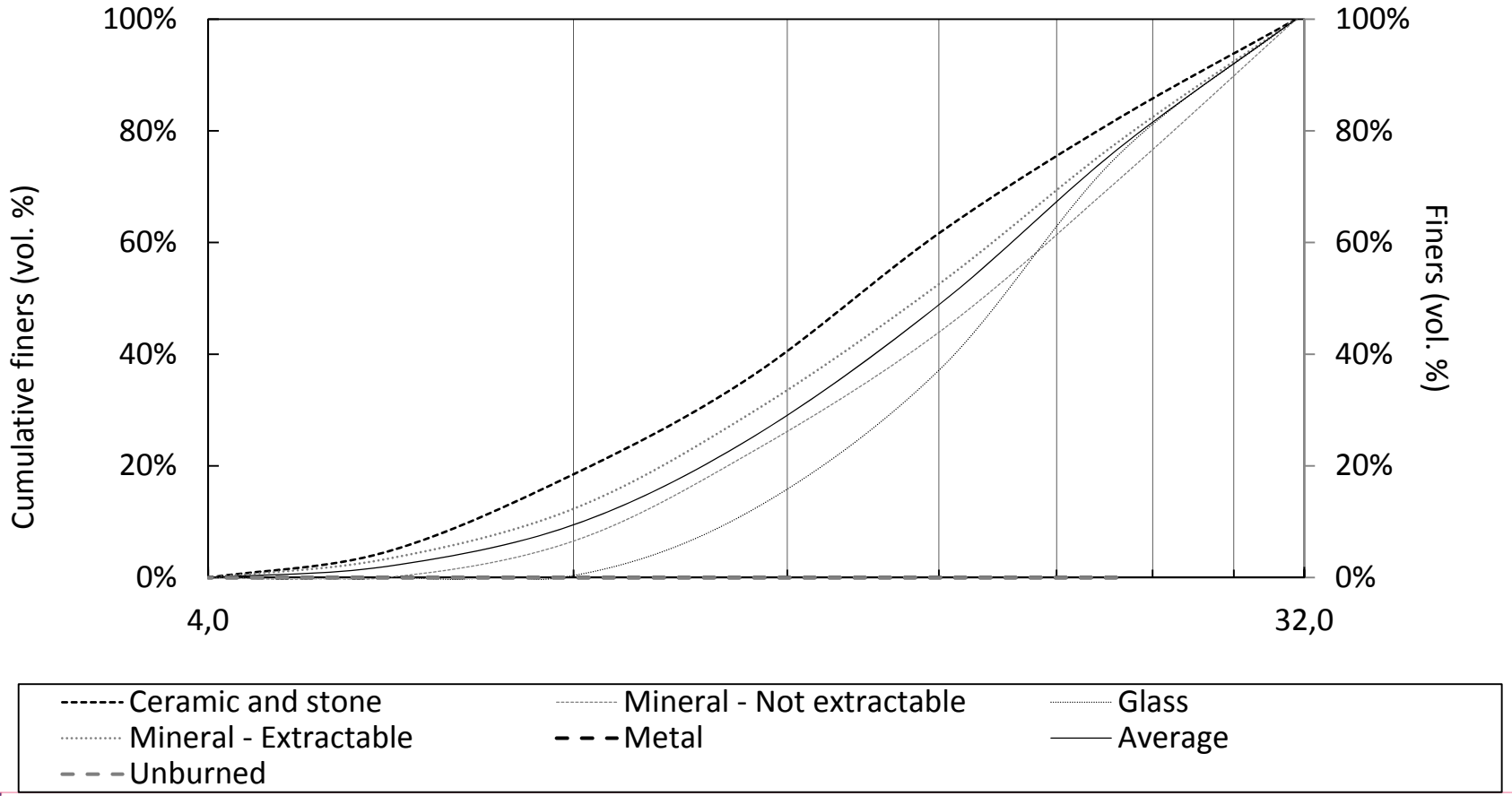
Unburned

Minerals extractable by magnet

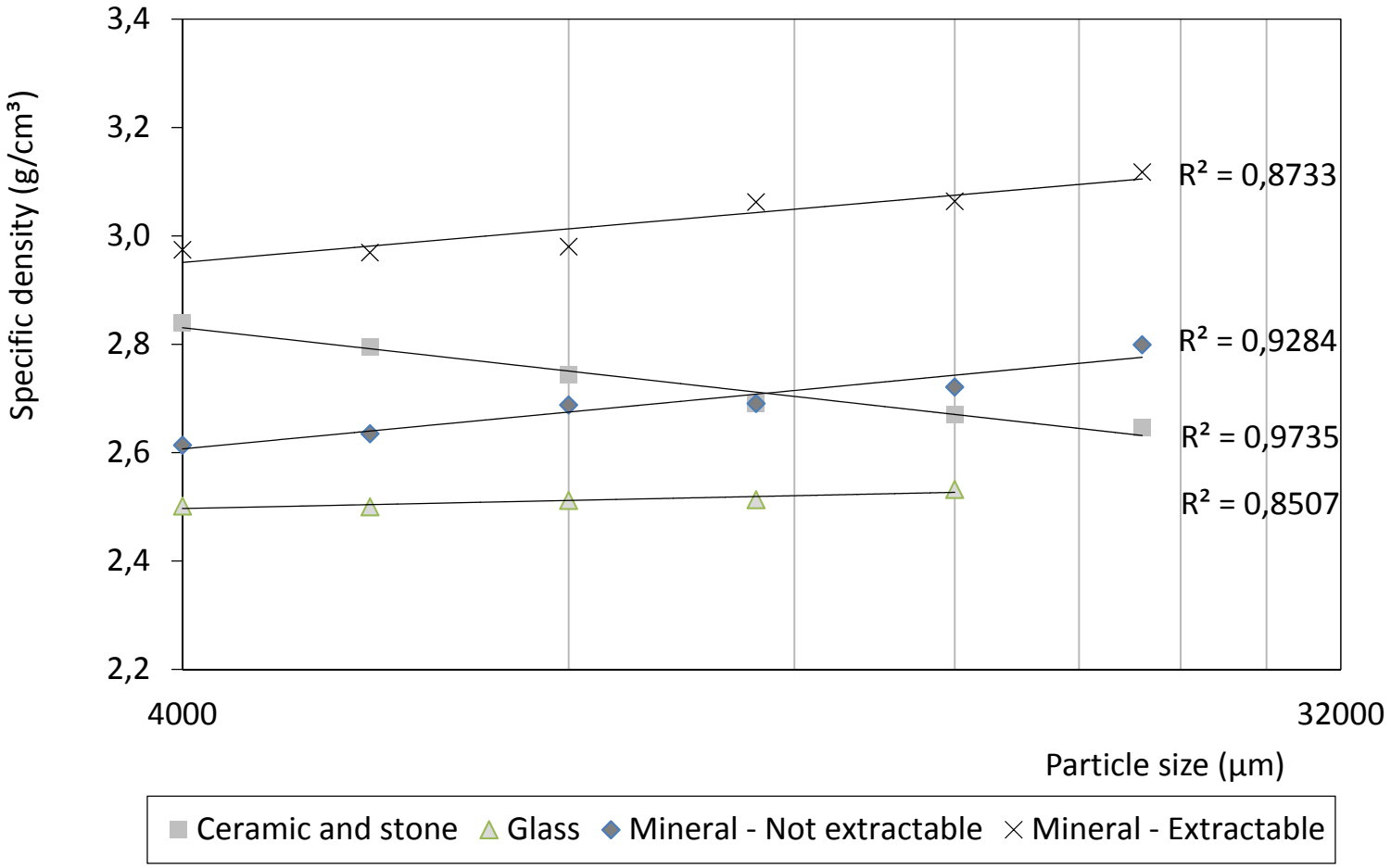
Particle size distribution of sorted material fractions



Porosity size distribution of sorted material fractions



Specific density of MSWI BA material fractions > 4 mm



Conclusions

- Coarse aggregates replacement is possible when taking legislation into account
- Highest porosity is present in extractable minerals (5.8%) and ceramics and stones (5.3%)
- With magnetic separation:
  - 70% of the mineral fraction is removable (32.5% overall)
  - A cleaner mineral stream of glass, ceramics and stones can be produced
  - The overall porosity of the remaining BA is reduced

Thank you for your attention!

- Questions, thoughts, ideas…