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Refractory blister potential
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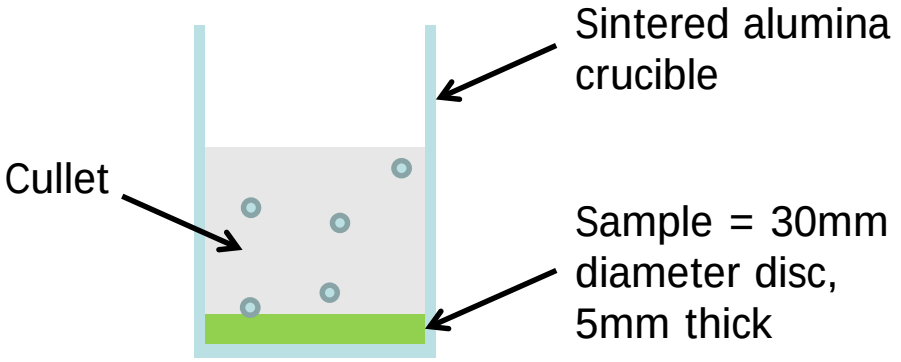
Presentation Overview

- Traditional NSG refractory blister test method
- Current NSG refractory blister test method
- Future activities and discussion

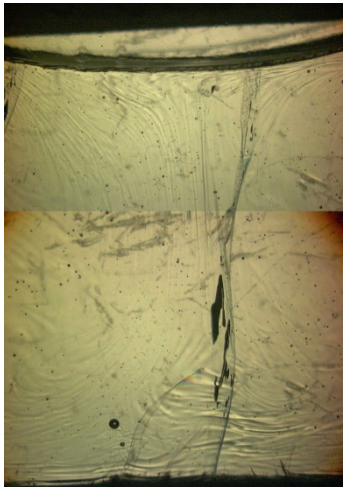
Traditional NSG blister test

- 72 hours at test temperature
- Blister count in a 5mm thick slice section

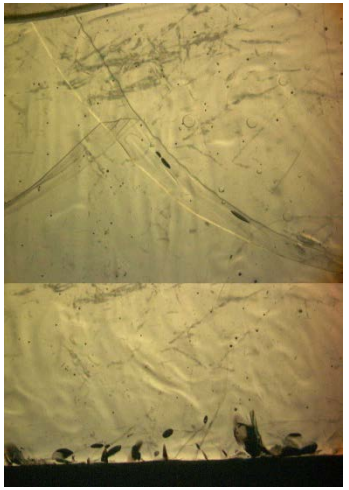


- How to differentiate between different sources of blister?
  - Crucible? Cullet refining bubble? Refractory?
- Alternative method to provide a more quantitative result developed

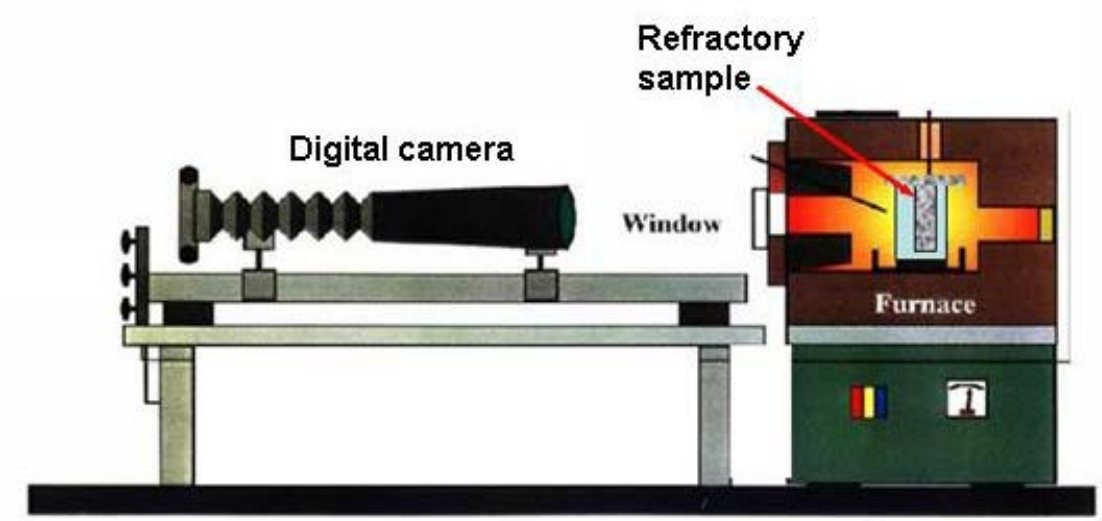
αβ-alumina

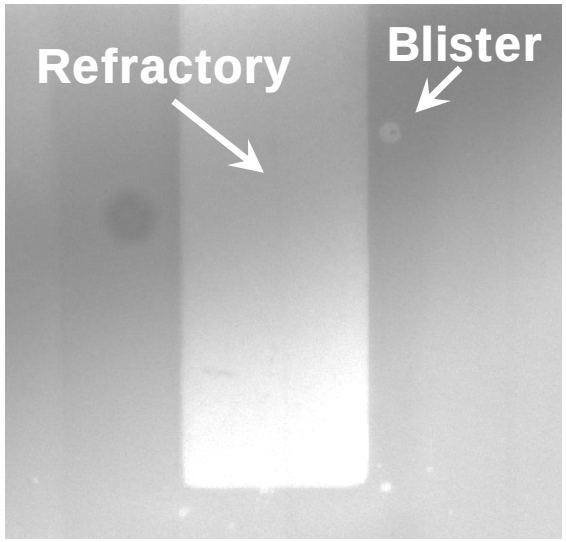


AZS



Current NSG blister test

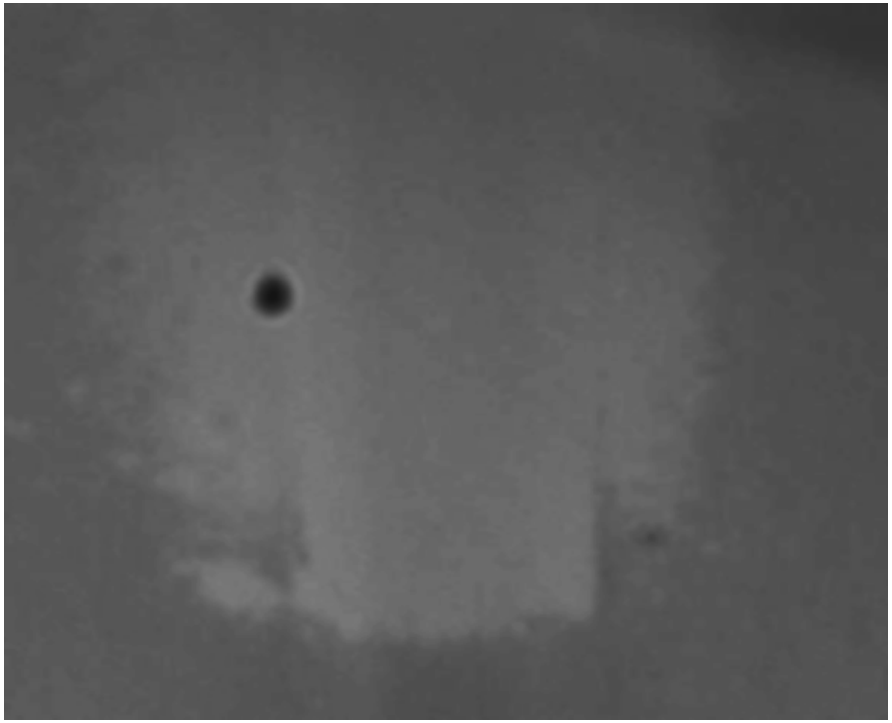




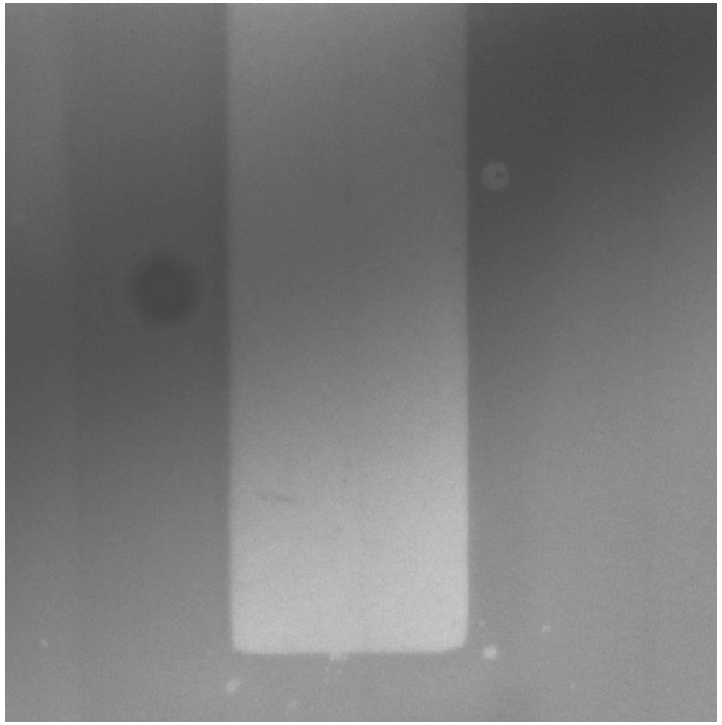
- Digital time-lapse photography of the glass / refractory interface to generate a real time image of blister evolution
  - Blister formation rates – no. of bubbles / hour / cm^2
  - Blister diameters

Blister potential examples

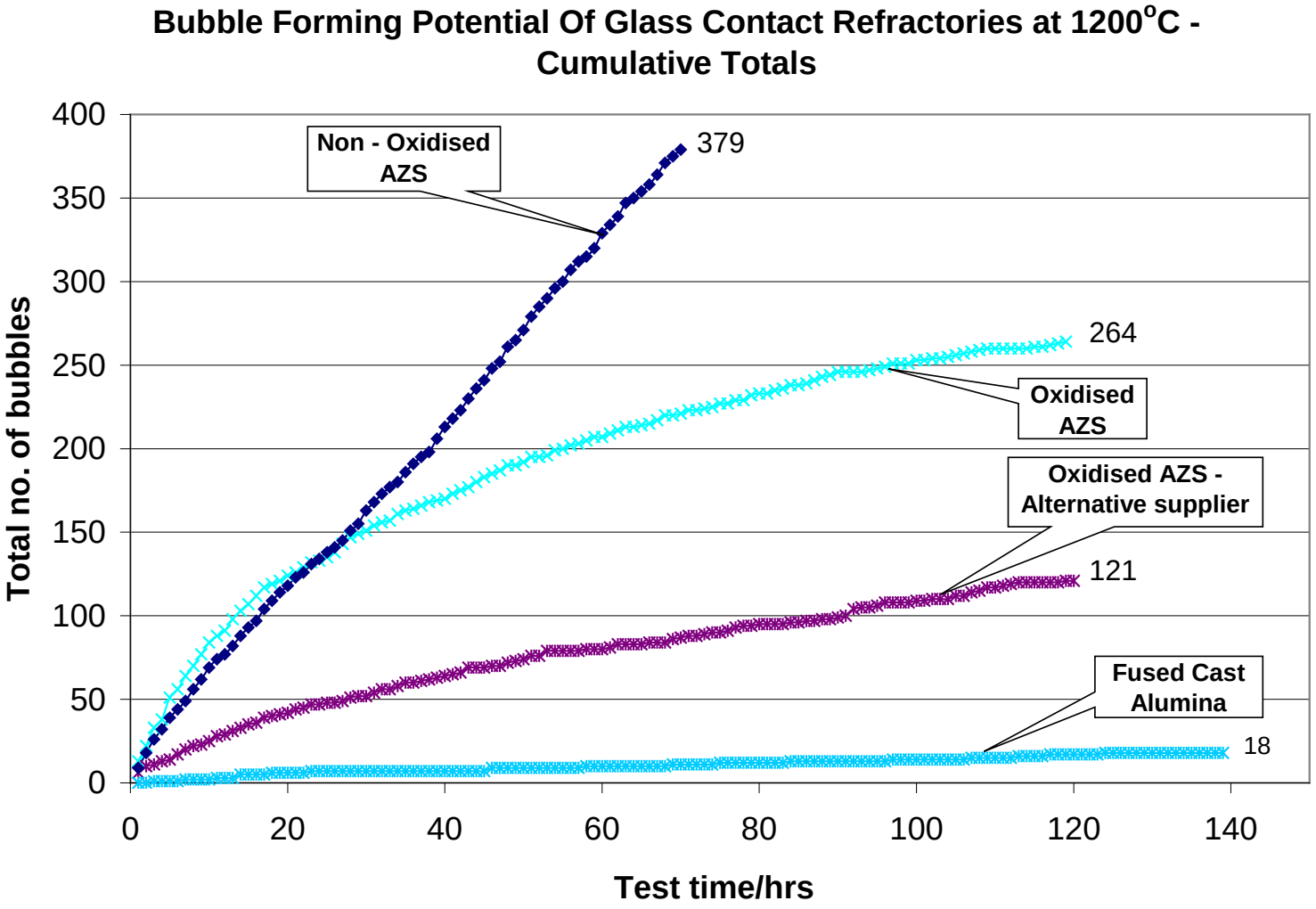
High blister potential “fizzing”



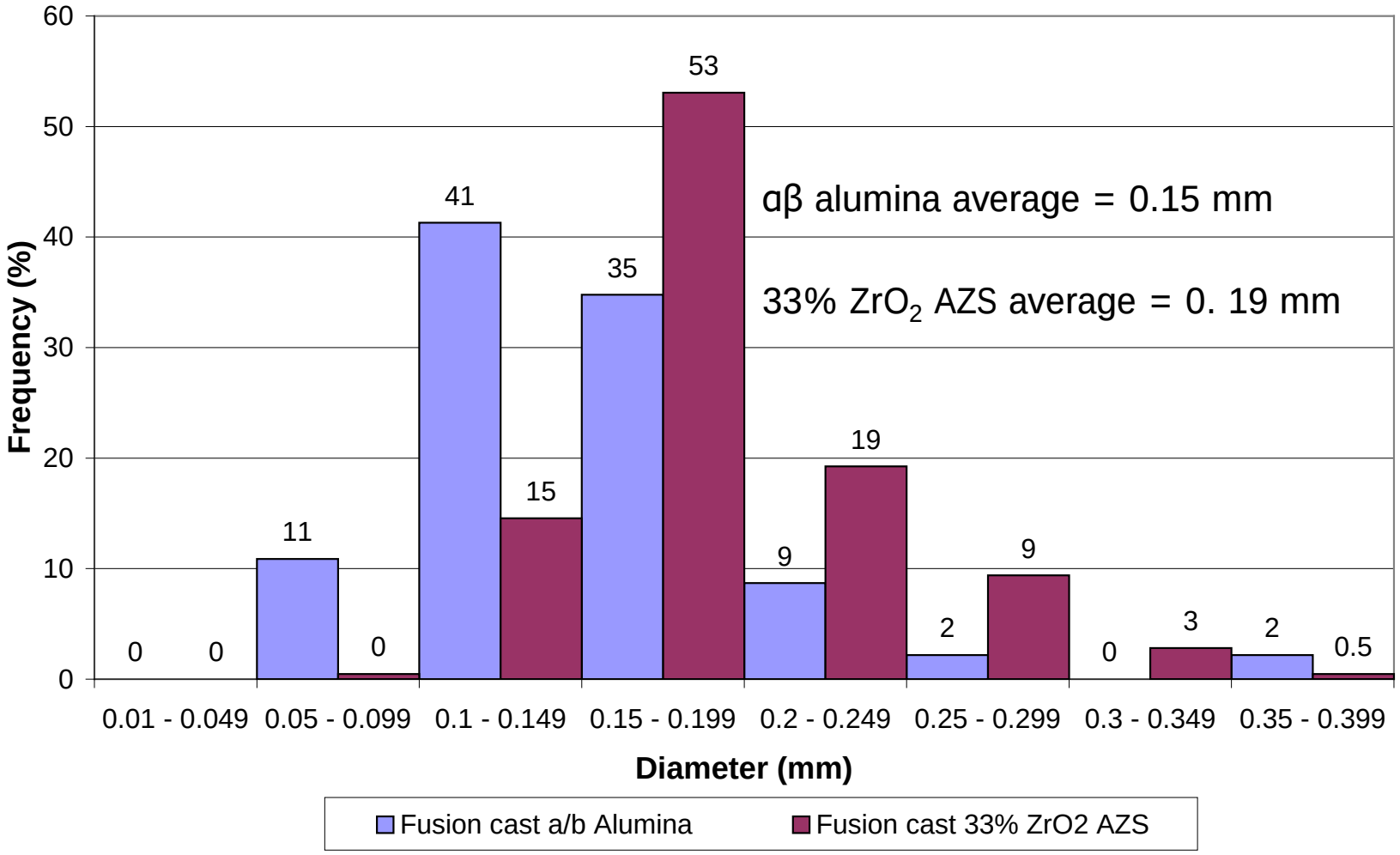
Low blister potential



Blister formation results



Refractory blister size distribution



Experimental limitations

- Test temp. limited to 1200^{o}C and times relatively short (<7 days)
- Glass becomes saturated in corrosion product
- Extracting the data from the experiments is time consuming and laborious
- Inconsistency in sample preparation due to
  - The heterogeneous nature of AZS refractories
  - Degree of surface contamination
  - Inability to control the degree of surface roughness
- What fraction will refine out as bubbles flow through the furnace?
  - Are the differences significant?
- Of those bubbles that ultimately enter the glass ribbon, how many are of a rejectable size?

Future activities

- Develop and standardise the test procedure to eradicate the limitations
  - Eliminate time/temperature constraints. How?
  - Minimise variation in sample preparation. How?
- Determine blister formation rates as a function of temperature
- Incorporate blister formation data into furnace bubble flow models to predict an overall contribution of refractory blister to background bubble levels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