

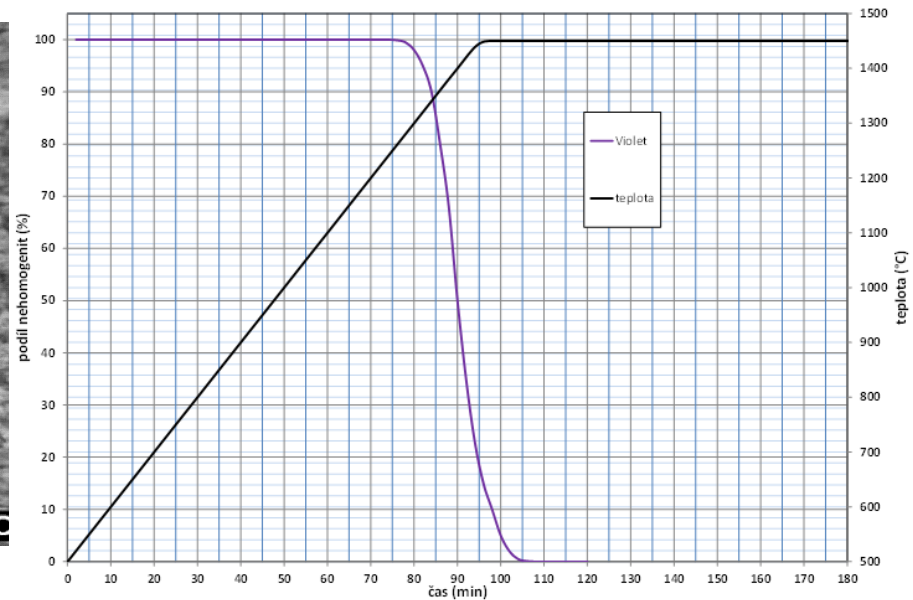
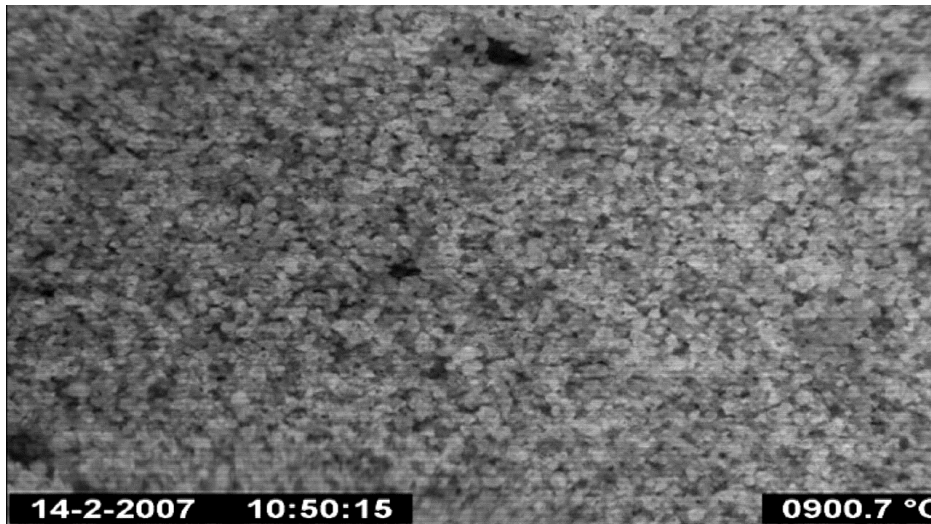
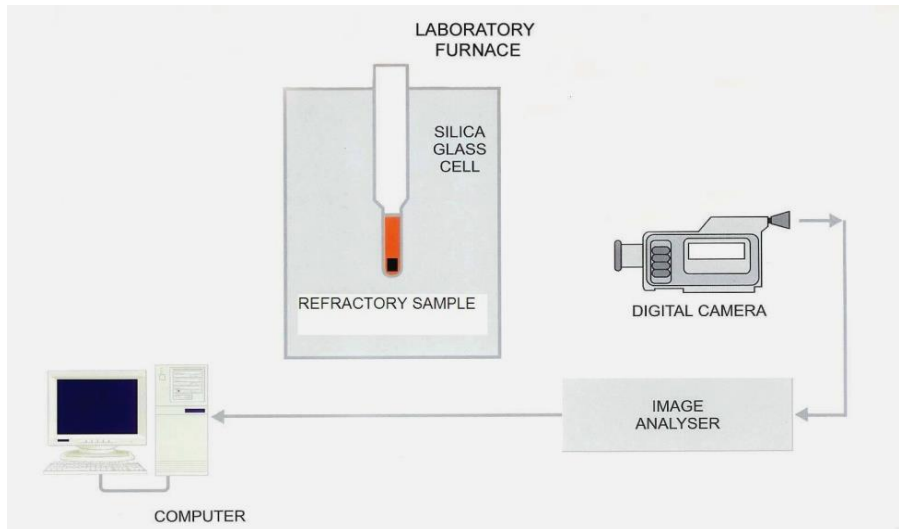
TC 18 Project on Batch melting kinetics

The development of a standard test to evaluate melting kinetics of glass forming raw material batches has been discussed and suggested as a new activity, which includes three steps: 1. Collection of procedures for evaluating batch melting kinetics by the different laboratories; 2. Drafting a new “standard” test procedure; 3. Round Robin Test using the standard procedure by participating laboratories.

The procedure should be able to compare and observe differences in batch melting kinetics of variable batch types, distinguished in batch composition, types of raw materials, batch pre-treatment (wetting, type of mixing, pelletizing), grain sizes of batch components and should give quantitative results (e.g. Batch Free Time at certain temperature).

Procedures for evaluating batch melting kinetics

1. Visual observation of batch melting



Procedures for evaluating batch melting kinetics

2. Batch free time test – RWTH Aachen

E. Meechoowas E. ata al.:
Improve melting glass efficiency by Batch-
to melt conversion. Procedia Engineering
32, 956-961 (2012).

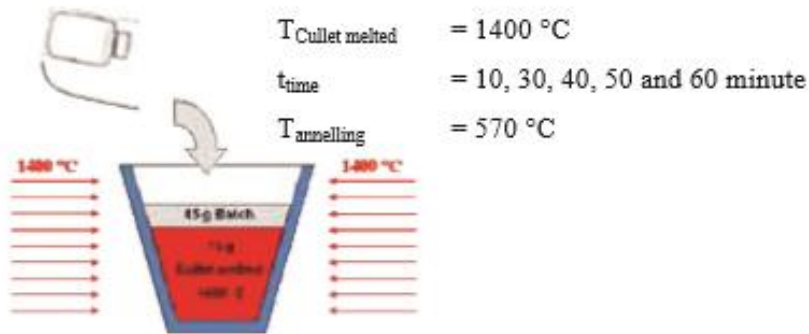


Fig. 1. Batch-Free Time testing

Widiya Jatmiko: Assessment of the
Melting Behavior of Batches Containing
Boron Oxide Carrier Raw Materials, PhD.
Thesis, RWTH Aachen 2014

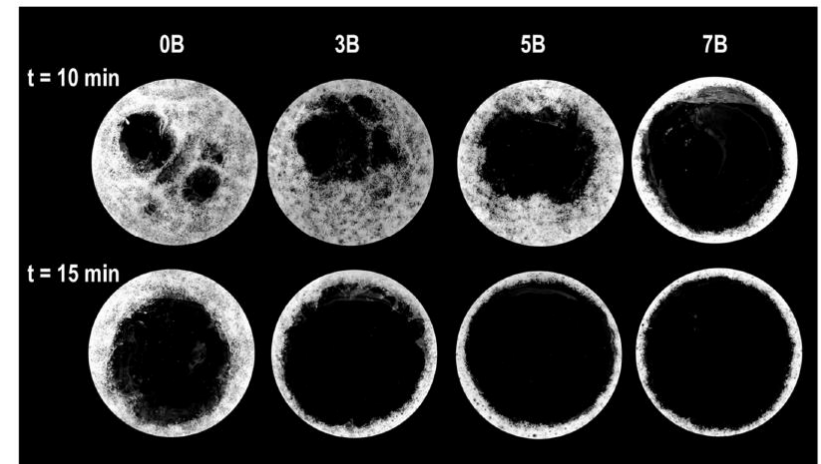


Fig. 45

BFT results of various B_2O_3 content in the system CMAS. The original images have been converted into a black (free surface) and white (undissolved batch) mode. This is then utilized to count the amount of black and white pixels with respect to the amount of melt and undissolved batch, respectively

Procedures for evaluating batch melting kinetics

3. Static Melting Tests

- Saint Gobain Recherche – Verallia
(Papin S., McDonald et al.)



Batch melting kinetics
Some R&D tools

Saint-Gobain Recherche/Verallia
TC 18 Prague, July 2013




SAINT-GOBAIN
RECHERCHE

Procedures for evaluating batch melting kinetics

3. Static Melting Tests

- Saint Gobain Recherche – Veralia
(Papin S., McDonald et al.)

Static Melting Tests

- Optical estimation % defects
- To measure the impact of
 - optimized raw materials
 - batch preparation
 - fining agents



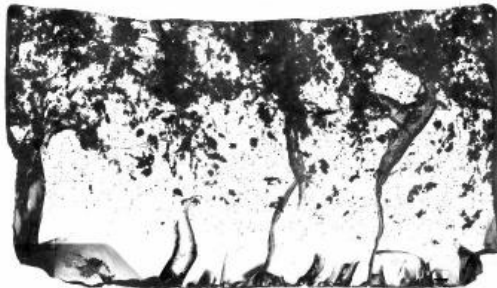
Procedures for evaluating batch melting kinetics

3. Static Melting Tests

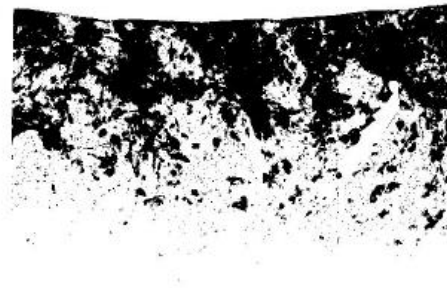
- Saint Gobain Recherche – Veralia
(Papin S., McDonald et al.)

Methodology – Image analysis

- With ImageJ
 - ▶ Clean picture (remove cracks and edges)
 - ▶ Threshold picture
 - Black pixel : defect
 - White pixel : elaborated glass.
 - ▶ Surface fraction of defect:
$$N = (\text{nb black pixel}) / (\text{total nb pixel})$$



Initial picture



Threshold picture



Procedures for evaluating batch melting kinetics

3. Static Melting Tests

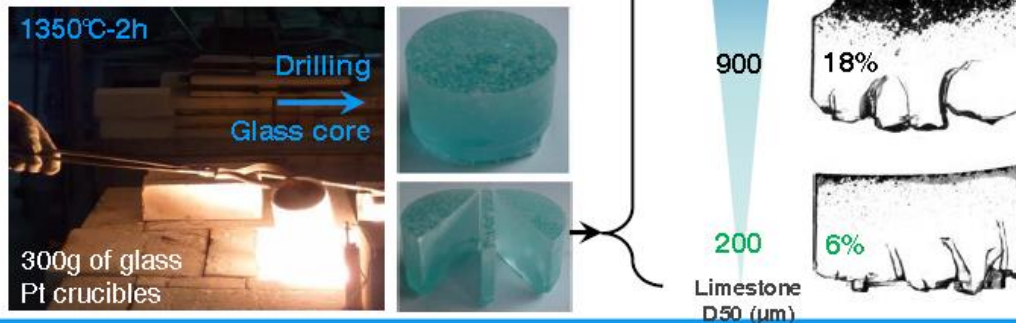
- Saint Gobain Recherche – Veralia
(Papin S., McDonald et al.)

Static Melting Tests – Exemple 1 - Melting

- ▶ Optical estimation % defects
- ▶ To measure the impact of optimized raw materials % residual defects

- ▶ **Protocole:**

- 1280°C/4h or 1350°C/1h
- 300g glass (target)



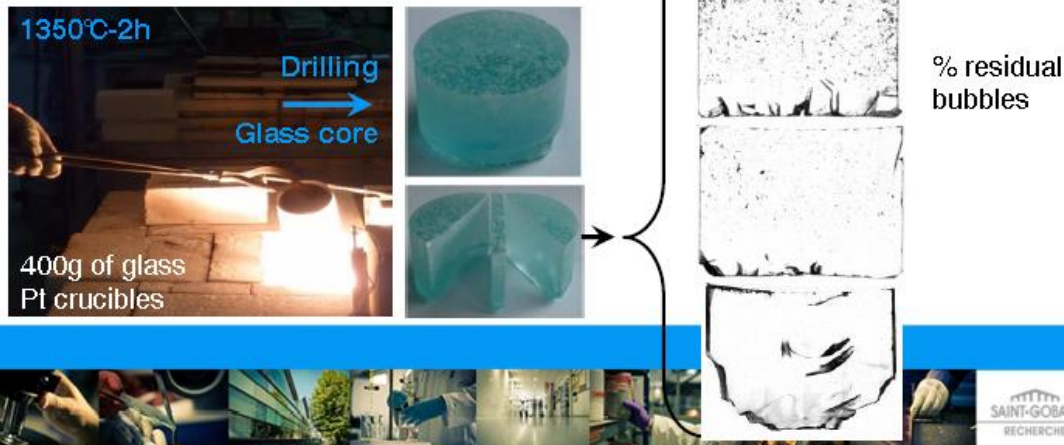
Procedures for evaluating batch melting kinetics

3. Static Melting Tests

- Saint Gobain Recherche – Veralia
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Static Melting Tests – Exemple 2 - Fining

- ▶ Optical estimation % defects
- ▶ To measure the impact of fining agents/conditions
- ▶ **Protocole:**
 - 1480°C/1h
 - 400g glass (target)



Procedures for evaluating batch melting kinetics

3. Static Melting Tests

- Saint Gobain Recherche – Veralia
(Papin S., McDonald et al.)

Example of results for melting/fining

