Project name: In-situ x-ray diffraction of high temperature stainless steel brazing

BEAM-TIME APPLICATION (Project) REPORT

dd.mm.yyyy - dd.mm.yyyy *(Date of the report to be added)*

General information

Name of the rapporteur	**Name of the rapporteur's organisation**
Axel Knutsson	Alfa Laval AB
Type of research (nanotechnology/health care/chemistry etc.)	**Name of the research facility**
Materials science	GEMS/HZG
Date of the measurement, duration	**Location of the event**
16/08/2013 – 8 hrs	Beamline HEMS (P07), PETRAIII, DESY, Hamburg
National Industrial Liaison Officer from rapporteur's country participating in the measurement	
Marc Thiry (HZG), Andreas Stark (HZG)	

Description of the project

Research description (short summary as written in the application)
Alfa Laval is an international Swedish company investing substantially in material science. One of our vital products is brazed stainless steel compact plate heat exchangers. Traditionally, such products are brazed with copper or nickel as the filler material. Approximately 10 years ago Alfa Laval presented a groundbreaking product to the market; a heat exchanger brazed with a stainless steel based filler material. The new filler material developed at Alfa Laval was a result of extensive R&D work, especially material science. However, even if thorough investigations have been performed on how the filler material is affected by alterations of the thermal treatments, the studies have exclusively been performed post brazing due to the experimental challenges. Therefore, there are great uncertainties on what phases evolve and when the phase transformations transpire during the brazing cycle. Hence, Alfa Laval is sincerely interested to perfor m an in-situ high temperature experiment using transmission wide angle x-ray scattering, allowing for a time resolved investigation of the evolving phases. The experimental setup should comprise a high vacuum furnace allowing for a heating rate of ~15 °C/min and maximum temperature of 1250 °C. We are confident that the investigation will result in both substantial contributions to the field and support us in our effort towards developing the next generation brazing methods.
Summary of activities (experiments performed, beam-time used, preliminary overview of results, next steps and other relevant information)
We performed measurements at the HEMs beamline run by GEMS at DESY in Hamburg. The plan was to perform time resolved measurements at the brazing materials. Due to unforeseen technical problems, this was not possible at the time. The thermal element of the induction heating device kept detatching during the measurements. Instead of the originally planned measurements, room temperature XRD measurements on the brazed

materials were performed, which gave some insight on the phase composition of the materials.

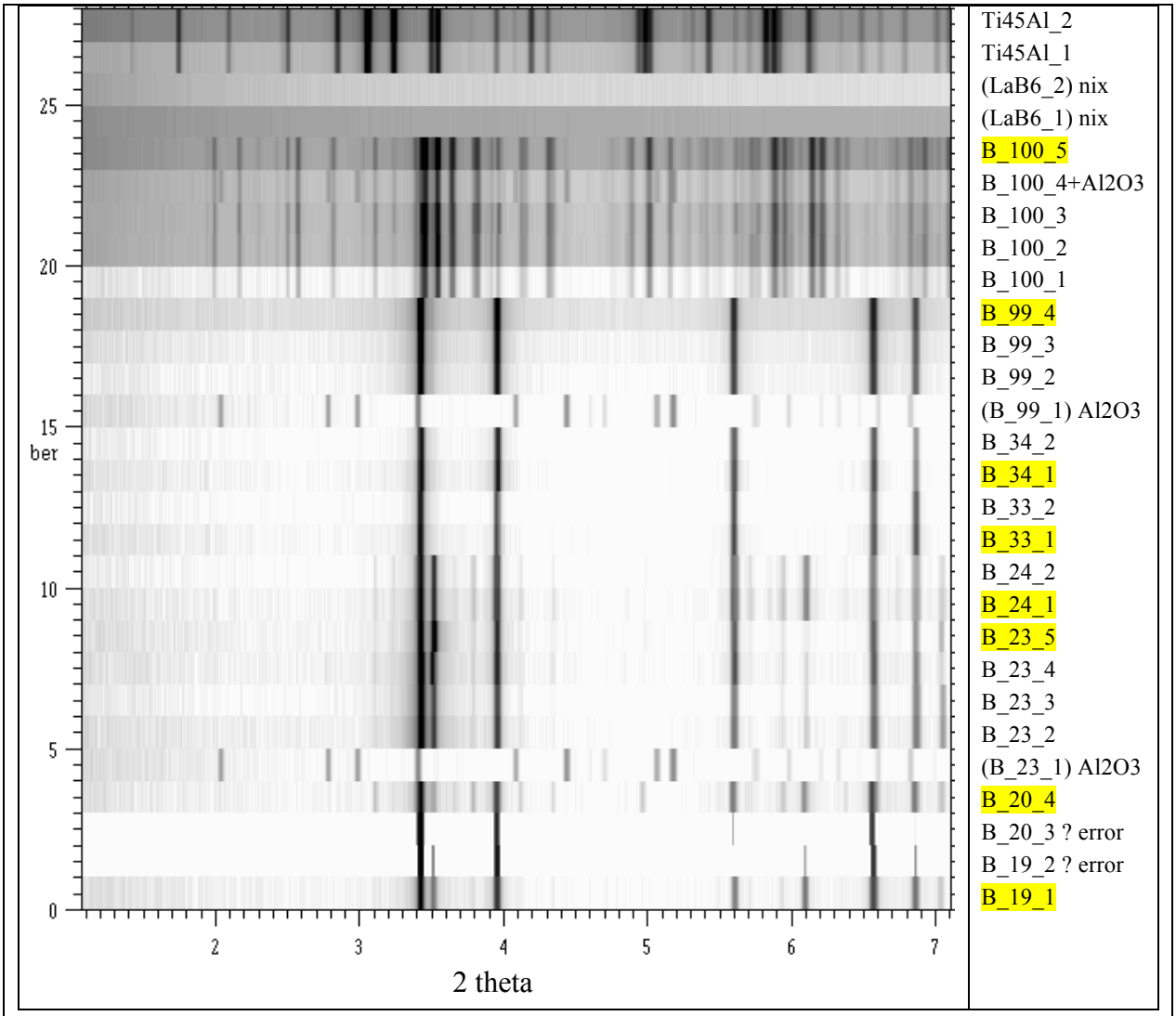
For a better qualitative analysis in future experiments one should increase the grain statistics (i.e. the number of grains in reflection condition) by moving or rotating the sample. Additionally one should reduce the background by increasing the exposure time.

For the time after the PETRA III shutdown, there will be further consultation about solving the technical problems and performing more measurements.

How would you describe cooperation and assistance from national contact points while preparing and carrying out the research at large scale facilities?

Annexes

Annexes
(list of annexes; meeting minutes, graphical illustrations, tables and other supplementary data)


25
20
15
ber
10
5
0
2
3
4
5
6
7
2 theta
Ti45Al_2
Ti45Al_1
(LaB6_2) nix
(LaB6_1) nix
B_100_5
B_100_4+Al2O3
B_100_3
B_100_2
B_100_1
B_99_4
B_99_3
B_99_2
(B_99_1) Al2O3
B_34_2
B_34_1
B_33_2
B_33_1
B_24_2
B_24_1
B_23_5
B_23_4
B_23_3
B_23_2
(B_23_1) Al2O3
B_20_4
B_20_3 ? error
B_19_2 ? error
B_19_1