ESRF	**Experiment title:** High temperature texture stability of cold rolled Ag substrates for $YBa_2Cu_2O_7$ superconducting tapes	**Experiment number:** HS969
Beamline: ID11 (2ond hutch)	**Date of experiment:** from: 29 Nov. 1999 to: 05 Dec 1999	**Date of report:** 2-5-00
Shifts: 18	**Local contact(s):** **Stephan Grigull**	*Received at ESRF:* 19 JUIL. 2000

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Report:

X-ray diffraction data on YBCO thick films (deposited on Ag (110) textured substrates (200μm) were measured in transmission geometry using a CCD detector (frelon) coupled to an image intensifier. The experiment was performed at 80KeV with a 0.8*0.6 mm^2 beam. A furnace specially developed at the ESRF for this experiment was used to melt in-situ the superconducting phase and to be able to follow the melting and solidification processes.
The first 5 shifts were used to align the beamline and set-up the experiment. The following 5 shifts were used to take calibration images and to collect data on ex-situ processed samples in order to caracterize the YBCO texture from the 2D images and to see the capabilities of the technique in systems with textured and highly absorbing substrates. The dynamic range of the detector showed to be a limiting factor in the experiment. The Ag peaks saturated at the minimum exposure times needed to be sensitive to the YBCO signal.
During the remaining shifts the oven was installed and two YBCO samples could be studied in-situ in the furnace. The first one was heated up to the melting point of the Ag substract in

order to calibrate the furnace temperature (the Ag melts 20 degrees above the YBCO under the reduced conditions used in the experiment). An instability of the Ag substrate texture was observed and the Ag recrystallisation process occurrring in two steps between 200°C and 800°C could be analysed. The second sample was heated up to the YBCO melting and subsequetly cooled down. The melting of the YBCO could be followed and the appearance of the Y(211) green phase was observed. Nevertheless cooling down the solidification of YBCO proved unsuccessful, possibly due to a too high speed in the cooling process (0.5C/min for the first 50 degrees).

The feasibility of the experiment proved successful, the dificulties were identified, the beamline and the furnace worked well. We foresee to continue the project dividing the experiment in two parts. The first will be focussed on the determination of the optimal conditions (speed, gas composition, temperature) to crystallize back the YBCO phase in-situ. For this experiment a non textured polycrystalline Ag substrate can be used allowing longer exposure times without saturation from the Ag. The second part will be focussed on the study of the texture process of the YBCO thick films under the same experimental conditions. Thinner substrates (80 μm) have recently been successfully obtained allowing us to reduce absorption and therefore enhance the YBCO signal in the future experiments.

Based on the experience and results acquired in this experiment, preliminary results on the feasibility of this technique to perform in-situ texture analysis of coated conductors have been reported in the following international conferences:

- 6th International conference on Materials and Mechanisms of Superconductivity and high temperature Superconductores, 20-25 Feb. 2000, Houston, Texas (USA).
- Topical workshop on coated conductors, 26-27 May 2000, Gottingen, Germany.
- 49th Annual (2000) Denver X-ray Conference, 31 July- 4 August, Denver, Colorado (USA).
- Material Research Society, 2000 Fall meeeting, 27Nov.-1 Dec 2000, Boston (USA).