



Frithjof Nolting :: Head of LSC :: Paul Scherrer Institut

Status PSI CB&TP

SFA-AM review meeting 2019

Poldi (Neutrons)

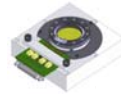
- Investment into beamlines, in particular detectors
- People with focus on industry oriented projects

Project	Status
Upgrade Poldi beamline	MCP/timepix time-of-flight detector produced and commissioned (co-funded by PSI) publications of first applications in preparation
Postdoc Poldi beamline	Several projects
Upgrade Materials Science beamline	The full infrastructure is ready. Test measurements with a smaller detector (co-funded by PSI)
Tomcat beamline Industrial Liasion	Hiring of an experienced scientist fully dedicated to the management of industrial activities at the TOMCAT beamline, starting March 1st 2019 Thanks to her very active work, in 2019 the TOMCAT industrial portfolio has been growing significantly
Project Office for TTC-AM	The proposal for the AM technology transfer center has been accepted and as of 1.12.2019 ANAXAM is in operation

Assessment and optimisation of LSP in metal AM

Proof-of-principle → application in large series study

M. Morgano, N. Kaletics, R. Loge, M. Strobl, submitted to Additive Manufacturing



**MCP ToF
 Imaging detector**
**Novel high efficiency
 technique at SINQ
 with new detector**

High ductility and transformation-induced-plasticity in metastable stainless steel processed by selective laser melting with low power

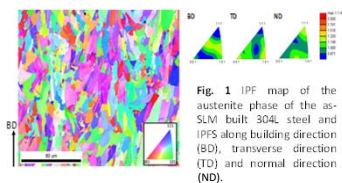


Fig. 1 IPF map of the austenite phase of the as-SLM built 304L steel and IPFS along building direction (BD), transverse direction (TD) and normal direction (ND).

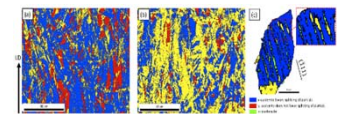


Fig. 4 EBSD maps under uniaxial loading: blue austenite orientations that favor, red that do not favor, the formation of stacking faults and ε-martensite at a) 0.26 and b) 0.42 true strain. α'-martensite in yellow and ε-martensite in green. c) Detail of a at 0.26 true strain, showing ε- martensite plates and α'-martensite.

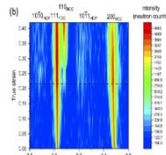
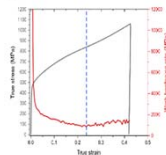
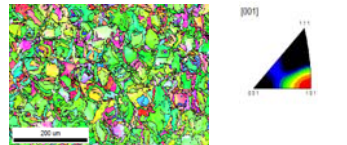


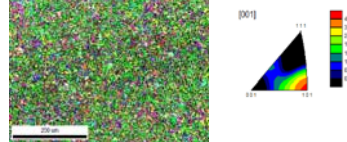
Fig. 2 a) True stress-strain and work hardening. **(b)** Evolution of neutron diffraction patterns showing the martensite formation (110_{BCC} , 1010_{ICP} and 1011_{ICP} reflections) after 0.23 true strain.

Different AM microstructures achieved

Strong 110 texture favorable for transformation during uniaxial tension



Strong 110 texture with small grain size



Strong 100 texture that do not favor, the transformation



Upcoming experiment at ORNL: FEB 10 – 14, 2020

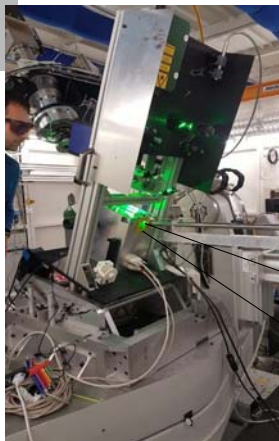
Materials Science beamline (Synchrotron)

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Laser printing of ceramics



Fuorclam consortium

Prof.Dr. K. Wegener
 Prof.Dr. T. Graule
 Prof.Dr. H.van Swygenhoven
 Ing. J. Stirnimann
 Dr. K.Florio
 Dr. S.Pfeiffer
 Dr. M.Makowska
 Mr. F. Verga

While waiting for the final detector the full IT and side infrastructure has been implemented for several projects, including Fuorclam.

Test measurements with a smaller fast Eiger (20kHz) at the MS beamline

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Tomcat beamline (Synchrotron)

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Tomcat beamline (Synchrotron)

✓ Successful industrial applications of state-of-the-art protocols developed at TOMCAT

- Multi-resolution tomography (*Dejea H., et al, Scientific Reports 9, 6996 (2019)*)
- Mosaic tomography with non-rigid stitching (*Miettinen A. et al, Bioinformatics, 1–8 (2019)*)
- Time-resolved tomography (*Mokso R. et al, J. Synchrotron Rad. 24, 1250–1259 (2017)*)

✓ 2 techniques explored for industry

- Time-resolved radiography
- White beam topography (*in collaboration with an ESRF industrial liaison scientist*)

✓ 22 successful proprietary beamtimes performed

✓ 14 companies availed our services; 7 are new customers

✓ Helped an SME

- thanks to her help and encouragement in writing the proposal, a Swiss SME received a CALIPSOplus voucher for one shift of beamtime at TOMCAT



✓ Contribution to beamline operations

- 4 academic beamtimes supported as local contact

TTC-AM (Neutrons and Synchrotron)

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AM-TTC: ANAXAM



Technology transfer center for Advanced Micro and Nanoanalytics

- employing the power of Neutron- and Synchrotronradiation

Association

anaxam

analytics for advanced manufacturing

www.anaxam.ch

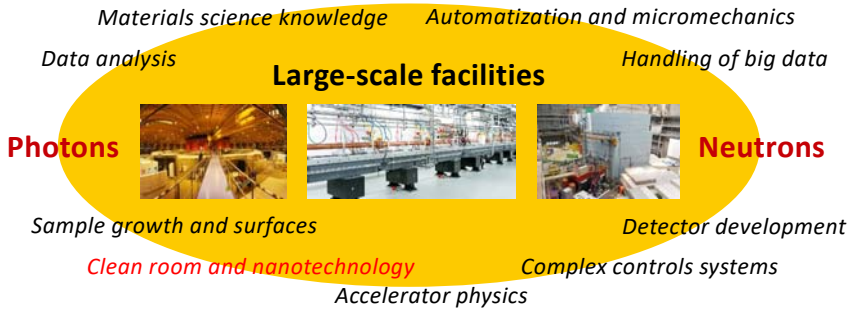
Founded May 2019

Start operation December 2019

CEO: Christian Grünzweig

Members: DECTRIS, ThyssenKrupp Presta AG, Swiss Neutronics AG, RC Tritec AG, CXCT, Chromos AG, Inspire AG, HTZ Aargau, IST, Leister Technologies AG, Turbocoating, ABB, SpectraFlow, Feintool, PSI, SNI, FHNW, Kanton Aargau
Supporter: Urma, DECTRIS, ABB, Spectraflow

Advanced micro- and nano-structure analytics



PSI an ideal place for advanced micro- and nano-structure analytics for Advanced Manufacturing

Funding of SFA-AM enables to improve capabilities and make them to the scientific community and to industry available

