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Coherent scattering domain measurements in Al-Cu-Fe alloys during in-situ heating. Carmen Mihoc^a, Manuela Stir^b, Eberhard Burkel^a. ^aUniversity of Rostock, Institute of Physics, Germany. ^bEMPA, Swiss Federal Laboratories for Materials Science and Technology, Thun, Switzerland.

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Al-Cu-Fe quasicrystalline alloys were recently developed as bulk amorphous advanced materials with high potential for applications like high-temperature thermal barriers, low-friction and wear-resistant coatings [1-4], composite biomaterials [5] or catalysts [6]. The crystallization of as-prepared alloys plays a crucial role in the technological application of these new materials. The nucleation and growth of nanoscale phases in these alloys during constant rate heating was investigated using high-resolution high-temperature powder X-ray diffraction.

A series of nanocrystalline Al-based alloys were synthesized by mechanical alloying. The temperature stability of the Al-Cu-Fe alloy was investigated by in-situ angular-dispersive X-ray diffraction at the B2 high-resolution diffractometer at HASYLAB. Constant heating rate annealing experiments were performed in inert gas atmosphere in order to analyse the evolution of phase constituents. The X-ray diffraction (XRD) patterns ($\lambda = 0.65125 \text{ \AA}$) were collected in transmission mode during heating up to 800°C. The formation of the single icosahedral quasicrystalline ψ -phase is the main crystallization event. The temperature dependence of the average coherent scattering domains was obtained using the Scherrer equation. Further analysis of the diffraction pattern are in progress, with the aim to resolve the temperature evolution of strain during constant rate heating and the crystallization kinetics.

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In-situ Neutron Diffraction Measurement on Co-Re Alloys at High Temperature. Debashis Mukherji^a, Pavel Strunz^{b,c}, Ralph Gilles^d, Michael Hofmann^d, Markus Hölzel^d, Joachim Rösler^a. ^aTechnische Universität Braunschweig, IfW, Germany. ^bNuclear Physics Institute, Řež near Prague, Czech Republic. ^cResearch Center Řež, Řež near Prague, Czech Republic. ^dTechnische Universität München, FRM II, Germany.

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Co-Re-based alloys are being developed at the TU-Braunschweig to supplement Ni-base superalloys at very high temperatures (1200°C) in gas turbine applications [1]. These alloys are strengthened by various carbides ($M_{23}C_6$ and MC types). Additionally, topologically close packed \square phase may also be stable in the alloys. Pure Co exists in two allotropic forms: as hcp \square and fcc \square structures and the high temperature

phase is metastable at room temperature (RT) [2]. Re addition stabilizes the \square phase at RT and therefore a hcp \rightarrow fcc phase transformation occur on heating the alloy. Using in-situ neutron diffraction measurements at Stress Spec and SPODI (FRM II) we monitored this transformation in two Co-Re-base alloys CoRe-1 (Co-17Re-23Cr-2.6C) and CoRe-2 (Co-17Re-23Cr-1.2Ta-2.6C) during heating and cooling in the temperature range 1100° and 1300°C. The reversible hcp \rightleftharpoons fcc transformation shows a large hysteresis (100K). On heating the transformation start and end at the same temperatures in both CoRe-1 and CoRe-2, but the reverse transformation occurs at different temperature ranges for the two alloys and the transformation lag behind by $\sim 25^\circ\text{C}$ (lower temperature) in CoRe-2. The Cr_{23}C_6 carbide and the \square phase play critical role in the phase transformation, but the TaC remains stable.

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FA2-MS13-P09

Binary Lanthanum Stannides: LaSn_2 , La_2Sn_5 , La_3Sn_7 , LaSn_3 . Michael Schwarz, Ines Dürr, Caroline Röhr. Institut für Anorganische und Analytische Chemie, University of Freiburg, Germany.

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In the course of our systematic studies on lanthanum triel/tetrel-ides the known binary lanthanum stannides were synthesized and structurally reinvestigated [1]. The structure types of LaSn_2 (NdSn₂ type), La_3Sn_7 (Ce_3Sn_7 type), La_2Sn_5 (Ce_2Sn_5 type) have only been assigned from powder data by comparison with the isostructural rare earth compounds, which are of note due to their magnetic properties [2, 3]. The title compounds were synthesized by arc-melting stoichiometric amounts of the elements. Their structures were refined by the means of X-ray powder Rietveld methods (La_2Sn_5 : *Cmmm*, $a = 464.52(5)$, $b = 3582.7(3)$, $c = 469.53(6)$ pm, $R(F^2) = 0.086$, $R_p = 0.061$; La_3Sn_7 : *Cmmm*, $a = 458.93(11)$, $b = 2630.3(7)$, $c = 470.48(13)$ pm, $R(F^2) = 0.086$, $R_p = 0.061$; LaSn_3 : *Pm3m*, $a = 477.86(2)$ pm, $R(F^2) = 0.095$, $R_p = 0.111$). Whereas these three stannides crystallize with the primarily assigned structure types, LaSn_2 did not form the reported NdSn₂ type. Instead, the new high temperature form crystallizes with the hexagonal AlB_2 structure type. Starting from the corner-sharing Sn_6 -octahedra of the tin-rich compound LaSn_3 , the structures of La_2Sn_5 (triple octahedral blocks), La_3Sn_7 (double blocks) and LaSn_2 (single octahedral layers) can be topologically described by a successive shearing of the octahedral blocks. A more detailed crystal analysis, now possible on the basis of the full structural information, reveals isolated zig-zag-chains (shortest distance $d_{\text{Sn-Sn}} = 307.1(2)$ pm in La_2Sn_5) running along the shear vector, rather than