Tailored precipitation (B2, L2₁) strengthened, compositionally complex FeAlCr (Mn, Co, Ni, Ti) alloys for high temperature applications

Christian Liebscher
Structure and Nano-/Micromechanics of Materials

Max-Planck-Institut für Eisenforschung GmbH

&

Konda G. Pradeep
Institute of Materials Chemistry

RWTH Aachen University
Tailor the phase decomposition in HEAs to establish CCAs for high temperature applications.

Preliminary results

**HEA branch**
High-throughput compositional screening

**Classical alloy branch**
B2-strengthened ferritic alloy (0Ti)

Stabilization of B2-CoAl precipitates

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Objectives and work programme

**Objectives**
- BCC-CCAs with tailored B2/L2₁-precipitates
- Low-cost, low-density alloys 6-7 g/cm³
  - Creep resistance up to 900°C
- Maximized solid solution strengthening & precipitation hardening

**Starting alloy systems:**
- Fe-Al-Cr-
- Mn-Co
- Ni-Ti

**Bulk mechanical testing (WP3)**
- compression, tension, creep

**Microstructural characterization (WP4)**
- 3D-APT
  - (S)TEM

**High throughput screening (WP1)**
- Identify promising alloy candidates

**Re-optimization loop**
- Microstructure-property relationship
- Property evaluation of optimized alloys

**Bulk synthesis (WP2)**
- Microstructure based alloy optimization (SEM, XRD, TEM, APT)
Contributions to the SPP and collaborations

Contributions to the SPP:
- Development of CCAs for high temperature applications
- Tailoring complex composition and phase space to optimize microstructure
- Establishing future low cost, low density alloys with good HT mechanical properties
- Microstructural optimization based on scale bridging characterization

Collaborations within the SPP:

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<td>Prof. Uwe Glatzel</td>
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<td>Dr. Michael Feuerbacher</td>
<td>Synthesis poly- &amp; single crystals</td>
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