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Materials Chemistry (MCh)

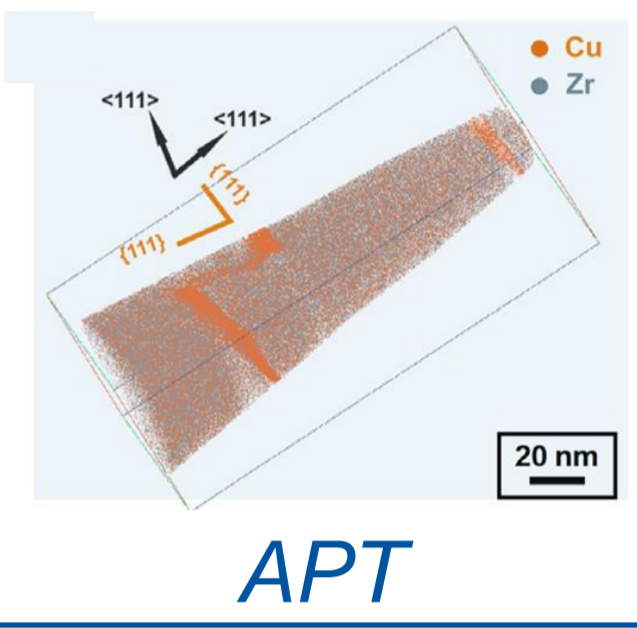
Goals 3rd phase

Content

- Investigation of the influence of interfacial phenomena between matrix (γ) and secondary phase (α - or κ -phase) on the local mechanical properties of multiphase Mn-steels
- Transfer and extension of the existing research strategy to include model systems of multiphase Fe-Mn-Al-C alloys

Methods

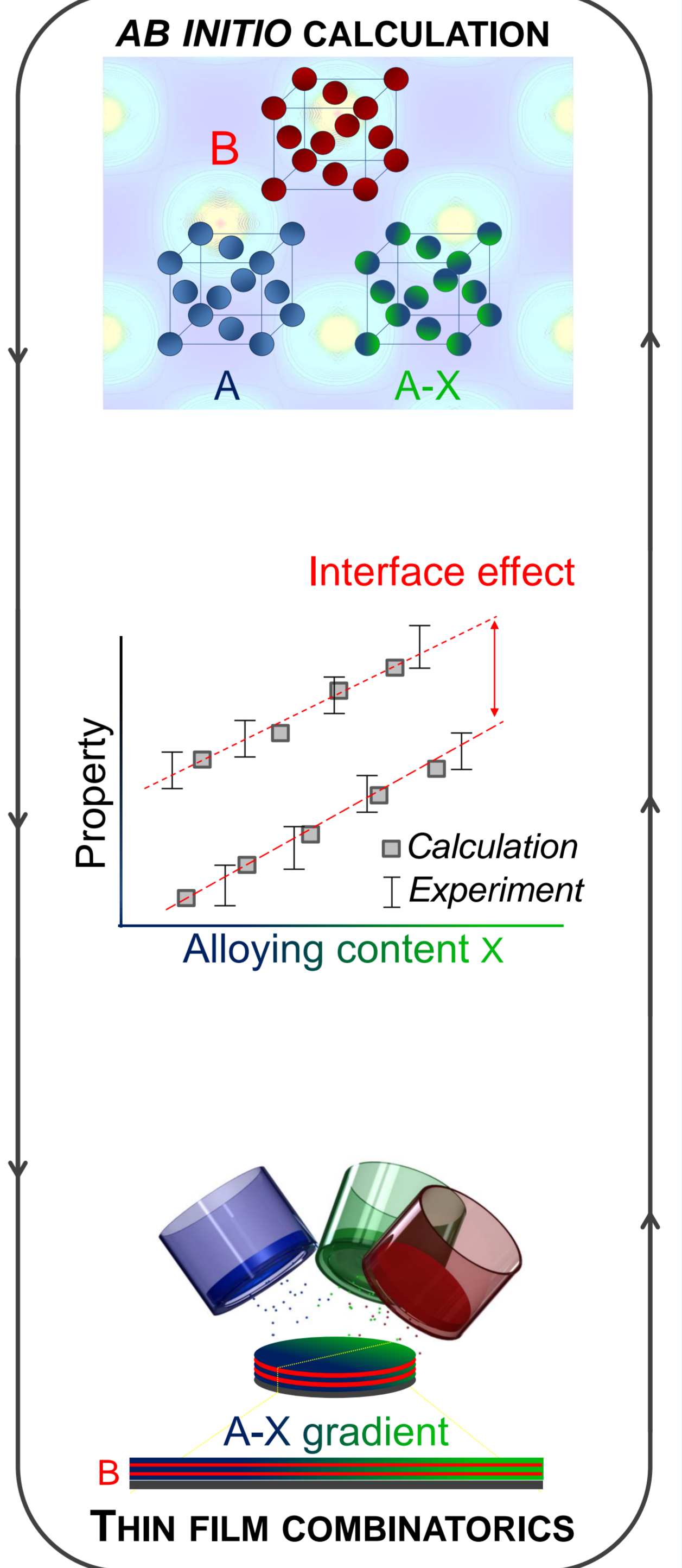
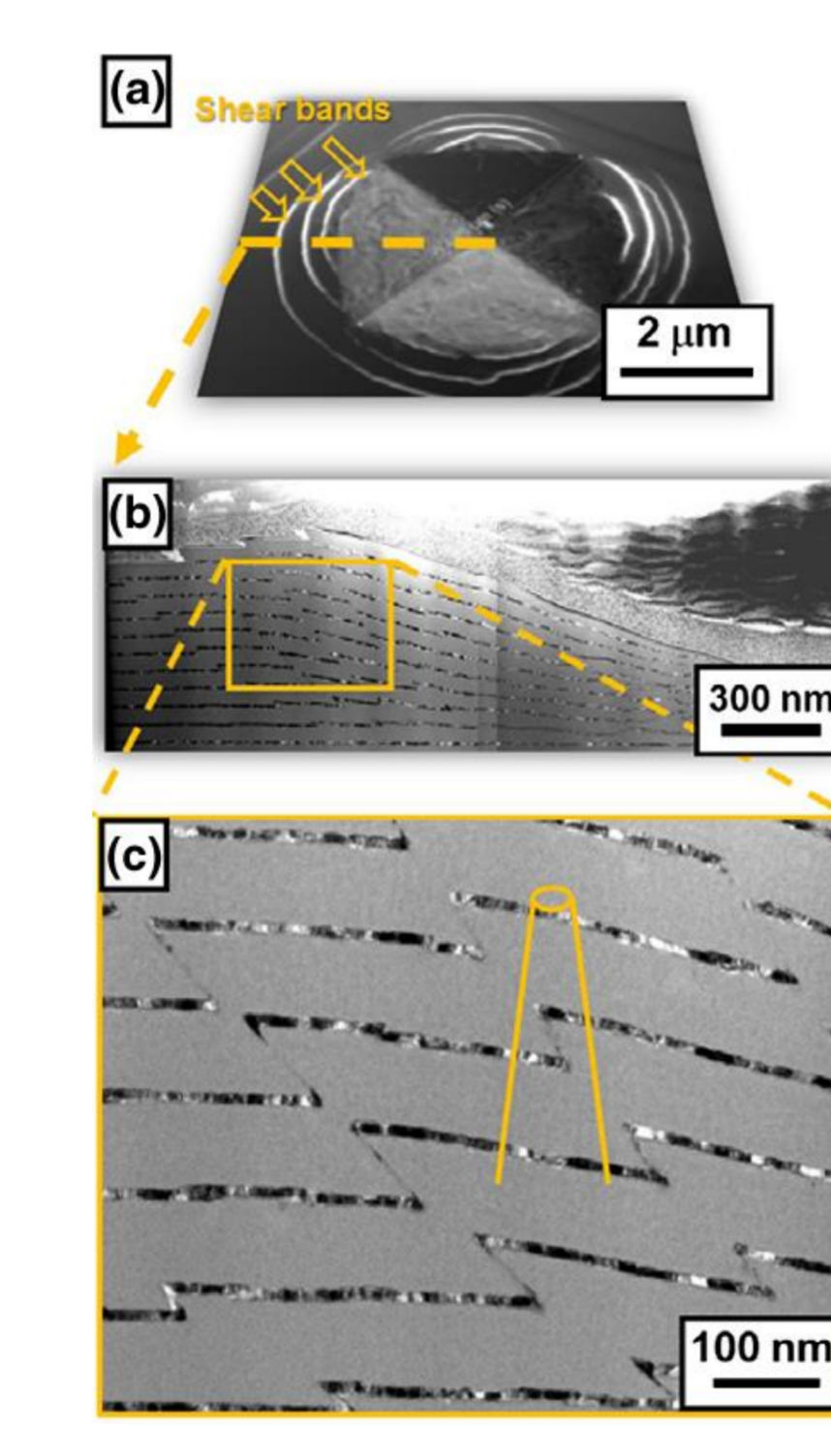
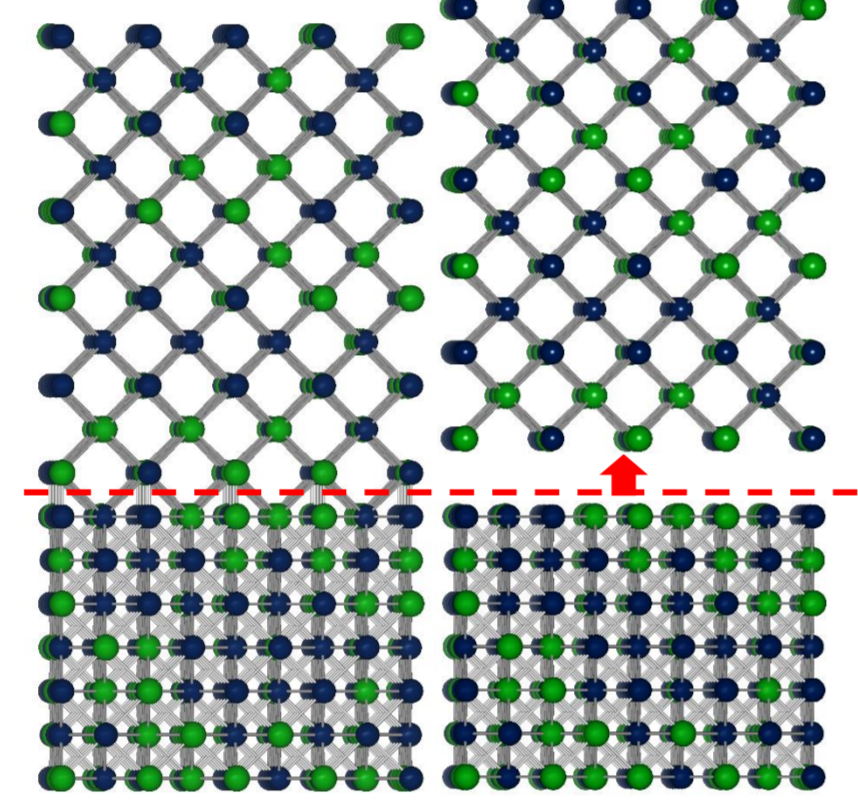
- Calculation of elastic constants and work of separation by **ab initio methods**
- Materials synthesis carried out by **thin film combinatorics**
- Characterization of:
 - Chemical composition (EDX, APT)
 - Microstructure (XRD)
 - Local mechanical properties (NI)



Input

- Structure of γ/α - and γ/κ -interfaces → **PP A1, A2**
- APT data of bulk samples → **PP C8**
- Bulk samples (NI) → **PP B1, B6, C6**
- Composition and structure of thin films (TEM) → **PP C1**

- Ab initio**-calculations of elastic constants and work of separation of model systems with 2D interfaces
- Synthesis of (graded) thin film model systems of multiphase Fe-Mn-Al-C alloys with planar 2D interfaces
- Characterization of structure, chemical composition and local mechanical properties of thin film model systems



Output

- Input data for plasticity and failure models → **PP A5, A7, A8, A10, B2, C6**
- APT data of model systems → **PP C8**
- Local mechanical properties → **PP B1, B6, C6**
- Composition-structure-data of Fe-Mn-Al-C (κ) → **PP A3, A5, C8**
- Layered structures with 2D interfaces → **PP C1**

Goals/Impact

- Design of multiphase Mn-based steels:
- Investigation of the correlation between structure, chemical composition, and local mechanical properties of Mn based steels taking into account the interfacial phenomena between matrix and secondary phase
 - Systematic study of the influence of alloying elements by *ab initio* calculations and nanoindentation

Work packages

- Local mechanical properties of γ/α multilayers with 2D interfaces within the system Fe-Mn-Al-C**
 - Thin film synthesis of α -phase and γ/α multilayers with 2D interfaces
 - Characterization (APT)
 - Local mechanical properties (NI)
 - Elastic properties and work of separation (*ab initio*)
- Local mechanical properties of γ/κ multilayers with 2D interfaces within the system Fe-Mn-Al-C**
 - Thin film synthesis of κ -phase and γ/κ multilayers with 2D interfaces
 - Characterization (APT)
 - Local mechanical properties (NI)
 - Elastic properties and work of separation (*ab initio*)

