Work Package 17: Case Study – Aluminium-Magnesium	WP 17: ALM
WP Leader: M. Feuerbacher, FZJ, Jülich, Germany	
Start date: Month 1	Start event: Kick-off Workshop
Participants: FZJ, CNRS-N, CNRS-G, CNRS-V, EMPA, CRPHT, UFRAN, ETHZ, USTUTT, ULIV, KUL, JSI, AGH-UST, TUWIEN, FHIMP, MPICP, TUDA, UMUN, UAUMA, UTORI, TUKO, KTH	

Objectives

The Case Study 1 serves as demonstration project. Without any lead time the consortium combines all its resources to investigate in a concerted action of all laboratories the production, the properties and the technical application potential of the giant-unit cell material β-Al-Mg. With 1168 atoms per unit cell it is at the same time prototypic for the science involved and, as a light-weight alloy, technologically interesting.

(a) Scientific: Production of β-Al-Mg. Characterization of all parameters from structure to physical/chemical properties in parallel and not as usually the case in sequence. Theoretical work on electronic and dynamic properties of suitable model systems. Work out processing procedures, prepare bulk material, thin films and coatings. Test properties under application point of view.

(b) Integration: Bringing people to work together immediately and in parallel on a joint project ranging from far-upstream basic science to application will have a strong integration effect from the beginning. Development and testing of a structure for materials distribution, information sharing, and coordinated cooperation of partners within and between different VILs with respect to the full characterization and technical exploitation of one selected CMA.

Description of work

(a) Scientific: Produce β-Al-Mg in single-crystal, polycrystalline, powder form. Determination (X-ray and HREM) of structure and defects as function of composition. Measurements of physical/chemical properties, e.g. electrical and heat conductivity, mechanical properties, surface structure, oxidation, corrosion, wetting, friction, wear, heat capacity, dynamical properties (by n-diffraction and NMR). Work out processing procedures for bulk material, thin films and coatings. Test properties under application point of view. Test of properties for technological application in particular as thermoelectric material, for hydrogen storage and as functional coating. Theoretical work on electronic and dynamic properties of suitable model systems.

(b) Interaction: This approach involves ***all VILs*** working in parallel. Close coordination of materials production (***VILs A/E***) with all partners. Optimisation of required materials properties as a function of composition via direct feedback between ***VILs A/E*** and ***VILs B/C/D***. Communication of materials parameters between experimentalists and theoreticians of ***all VILs***. Exploitation of property-optimised material (***VILs A/E***) with respect to technological applications (***VIL F***).

(c) Integration: Practicing of cooperation, joint planning and coordination of platforms and of manpower in different ***VILs***. On this basis improve strategy for getting added value out of networking and for **evolution from coordinated to integrated research**. Definition of practical requirements for effective information-sharing database acting also as prototype for databases for further CMA alloys approached.

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Deliverables

(a) Scientific: D17-1: Status report on state-of-the-art knowledge on the properties and technological potential of β-Al-Mg, processing procedures and parameters for technical applications, structure-property relations and theoretical description worked out. Articles in journals. D17-2: Reports on topical meetings. D17-3: Articles in high-standard journals.

(b) Interaction: D17-4: Reports on virtues, problems and chances of ***VIL-concept*** in approaching materials-oriented work packages.

(c) Integration: D17-5: Report on structure for efficient and fast joint action on a promising material serving also as example of task-force like approach for accelerated joint research **from basic to technology transfer to manufacturers**.

Milestones
(a) Scientific: Month 6: M17-1: Delivery of samples to experimentalists by ***VIL A***. Strategy for effectively linking the structural and theory approaches; Month 12: M17-2: Presentation of first results on properties and of calculations of electronic and thermodynamic properties of β-Al-Mg. First results on β-Al-Mg coatings. Month 18: M17-3: Improved bulk material with respect to exploitable properties. Surface coatings produced, first properties measured.
(b) Interaction: Month 6: M17-4: Establish interaction and feedback with other ***VILs***.
(c) Integration: Month 6: M17-5: First joint materials production; Month 12: M17-6: Structure for efficient interaction and joint decision-making among participants of ***VIL A, E*** and other ***VILs*** established.