Research Physical Metallurgy of Lightweight Metallics and ICME Methodology

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Research background and purpose

- Enhance the R&D robustness and opportunities for *KUMADAI Mg* alloys for aerospace and other applications.
- Help build up and solidify the foundation of research and research topics in Ti alloys.
- Initiate and educate regarding the research methodology of CMS and ICME at the Kumamoto University.

Main research contents

- Integrated Computational Materials Engineering (ICME) and computational materials science (CMS) for Ti and Mg alloys for aerospace applications: multiscale modeling and simulation, physics-based microstructural modeling linked with crystal plasticity modeling for property prediction and component application. Statistics-based data mining with digital databases integrated with computational and experimental tools.
- Data science and data-mining methodology.
- Ti alloys and microstructures: alloy design, development and applications. Novel processing methods including additive manufacturing.
- Mg alloy design and process, and application development Ultrahigh strength Mg alloys with 30% lower density than Al7xxx alloys, but with the strengths of Al7055 for aerospace, auto, and rail applications; nonflammable Mg alloys; die-casting and wrought processing for applications.
- In situ deformation of the DS *KUMADAI Mg* to further understand the kink formation and the dynamics of kink strengthening.

Expected result • Application

- KUMADAI Mg for structural applications and for other functionalities.
- International research collaboration enhancement for MRC and TRC.
- Robust research and capable researchers at the Titanium Research Center (TRC).
- National Taiwan University : Corrosion science and coating protection methodology of *KUMADAI Mg*.
- Japan + V4 proposal : Development of Advanced Magnesium Alloys for Multifunctional Applications in Extreme Environments.
- Three U.S. Patents : on Al-(high) Mg-X (Ca, Cr, Mn, Zr); TiAl; US20180298473A1; US20180298478A1.

Research fieldPhysical metallurgy of aerospace materials; Aerospace applications and methodology of light metals
of Ti and Mg alloys. Integrated Computational Materials Engineering (ICME)KeywordsPhysical metallurgy; Light metals; Aerospace; ICME; Hydrogen behavior; Cellular solidsURL:https://scholar.google.com/citations?user=lheftRYAAAAJ&hl=ja.