Research on light weight metals with high strength and workability

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Research theme：

Currently, the development of metallic alloys which solves the environmental problem is strongly demanded. Nowadays, the methodology of alloy design in the world are focusing on the development using “Ubiquitous” elements like Fe, O, N. And it will be a key technology how we can recycle the metallic alloy products. Hereafter, microstructural control of metallic alloys further plays an important role than the current situation. Additionally, the establishment of 3D-additive manufacturing process as a new innovative technology is also required.

On the basis of these trends, our laboratory carries out the research on enhancement of mechanical properties thanks to new type of deformation process and microstructural control approaches of light weight structural metallic alloys of Ti, Mg and Al based alloys. Our works specifically aim at microstructural control of grain-refinement, crystallographic-texture and precipitation behavior produced by deformation processing such as rolling, forging and wire drawing. Additionally, our laboratory also focuses on combined process of powder metallurgy and forging for new type of processing. Furthermore, we also challenge to fabricate the metal/ceramic composites by the additive manufacturing process of selective laser melting, which is collaborated with Kagawa Prefectural Industrial Technology Center.

Thus, we are developing the processing and microstructural controlling technologies of metallic alloys for enhanced mechanical properties from the both viewpoints of experimental, theoretical and machine learning approaches.

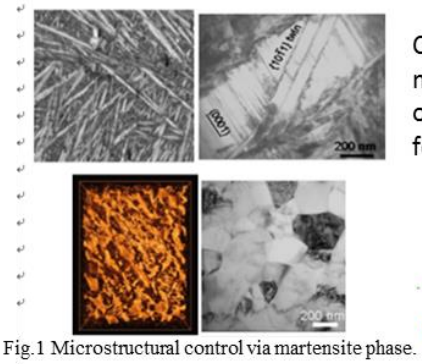

Fig.1 Microstructural control via martensite phase.

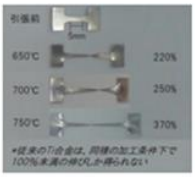

Fig.2 Low temperature superplastcity of Ti alloys.

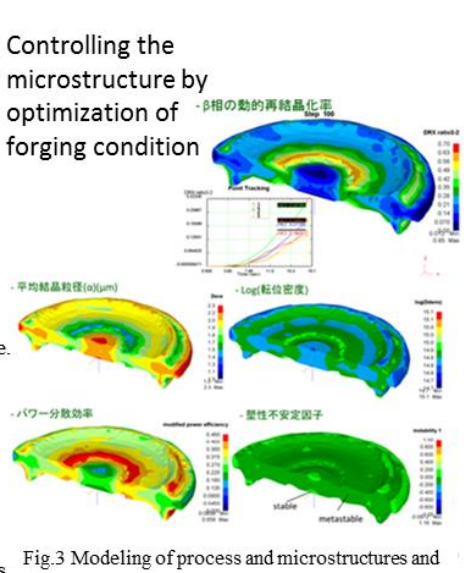

Fig.3 Modeling of process and microstructures and FEM analysis of Ti-6Al-4V alloy products.

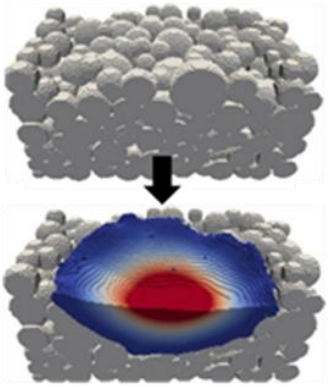

Fig.4 Process design of 3D-additive manufacturing.