

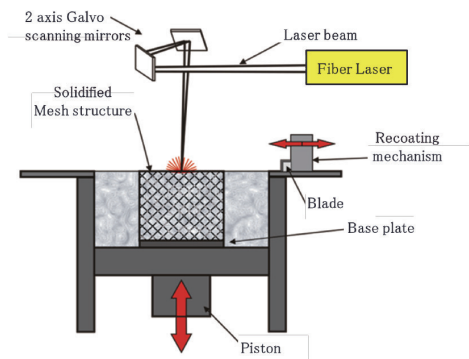
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Purpose of Research

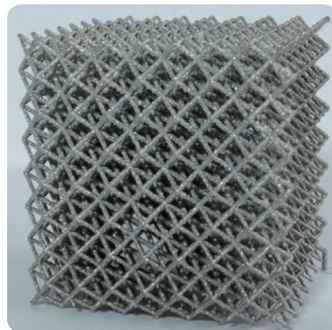
In order to realize the main purpose of material mechanics—namely, utilizing materials safely without waste—this study was undertaken with the aim of developing a manufacturing technology with a refined structure through the use of a metal 3D printer and to evaluate the mechanical characteristics of formed objects using numerical simulation analysis.

Summary of Research

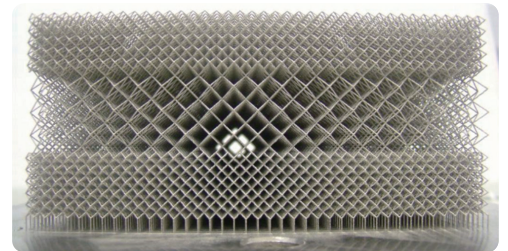
An ultra-light cellular (micro lattice) structure, which is expected to be widely applicable in fields ranging from medicine to aerospace, was produced using a metal 3D printer utilizing an additive manufacturing (AM) technology. The mechanical properties of the formed objects were then evaluated using numerical simulation analysis.



Modeling of a lattice structure by exploiting the characteristics of a metal 3D printer



Example lattice structure #1



Example lattice structure #2

Comparison with Conventional or Competitive Technologies

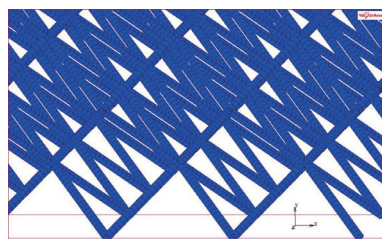
- The lattice structure has a specific strength that is equivalent to a honeycomb structure but is more lightweight.
- The lattice structure has a large surface area, offering improved heat radiation.

Expected Applications

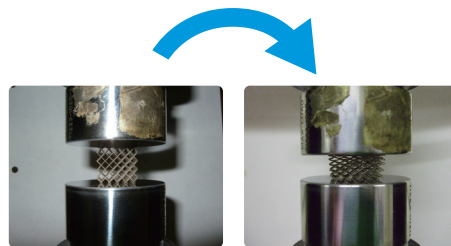
- Can be used as an impact absorption material for vehicles
- Can be used to manufacture a highly efficient heatsink since it can be designed to have an internal structure that allows for thermal conductivity control

What We Expect from Companies

We are now searching for companies with which we can carry out joint research to develop new applications for lattice structures.



Numerical simulation analysis



Strength evaluation test

Points

- Optimization of lattice structures using numerical simulation analysis technologies
- Formation of an actual lattice structure using the metal 3D printer at the Tokyo University of Science's Tribology Center and performing of an evaluation test

Future Developments

- Development of a heat insulation structure and a heat radiation structure using the new cell structure
- Development of a new light-weight metal structure using a textile structure
- Development of a spatially expandable structure by imitating origami (the Japanese art of paper folding)

- Prototype: Completed
- Sample: Available