

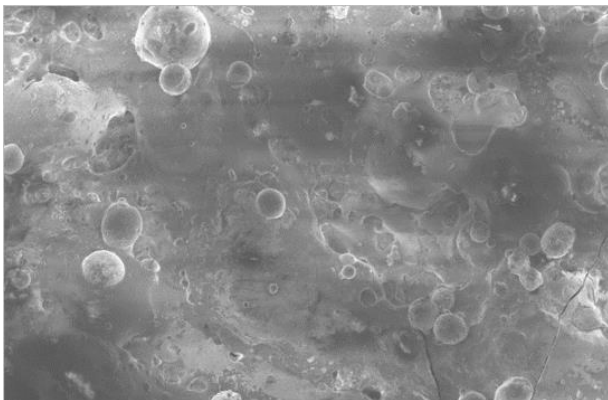


A process model for Selective Laser Alloying

Titanium-boron alloys (Ti, TiB, and TiB₂) are in great demand in industrial, automotive, biomedical, and aeronautical parts manufacturing for their high stiffness, strength, conductivity, and wear resistance properties. Lack of advanced processing approaches, however, limited its potential wide applications. The traditional diffusion surface treatment methods or cast and powder-based metallurgical approaches can also significantly affect the micro-structure of the output alloy, impairing the quality of its physical properties.

This invention describes a novel process of free forming (3D printing) device/product based on the concept of selective laser alloying of elemental powders to produce ceramic parts with desired shape and internal structures. It could provide opportunities to transform material/structure/device design and fabrication with following advantages: 1) adjusting material composition along all three axes of a part, 2) significantly reducing energy consumption in laser processing, 3) processing high melting point ceramic materials from elemental powders at lower melting temperature, and 4) creating micro scale porous structures with controllable shape, size and distribution.

Figure showing laser processed Ti-B surface sample



(image source: inventors)

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Competitive Advantages

- 3D printing (free forming) hard to process ceramic materials
- Produce products parts with complex internal/external shapes or structures
- Saves on processing time and heating requirement
- Simplified process model and parameters
- Alloys of varying porosity can be produced by controlling parameters
- Self-sustaining/controllable laser boriding process

Commercial Applications

- Impact resistant armor,
- Cutting tools,
- Wear resistant coatings,
- TiB₂ cathodes
- Energy Storage
- Health care
- Aerospace

IP Status

- Patent pending
- Licensing available

Status of Development

- Prototyping stage

Lead Inventor



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