

Rapid Manufacturing of Aluminum Alloy Parts

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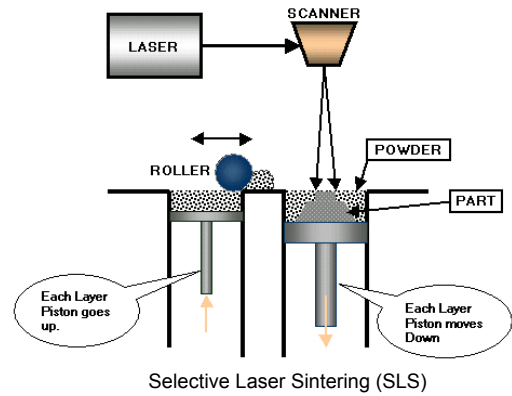
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Rapid Manufacturing (RM)

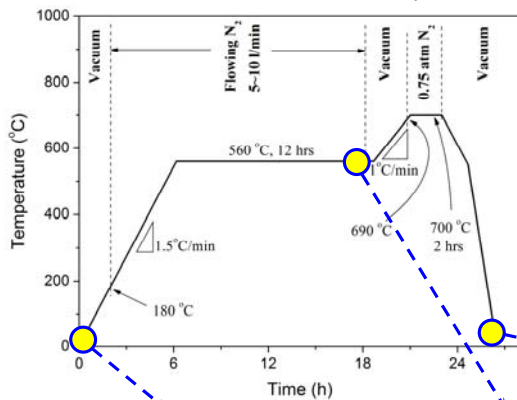
A set of related technologies that are used to fabricate physical objects directly from CAD data sources without the use of any tooling or machining.

Selective Laser Sintering (SLS)

A RM method, which uses a laser beam to selectively fuse powdered materials, such as nylon, ceramic and metal, into a solid object. In SLS, a laser traces the pattern of the first layer, sintering it together. The platform is lowered by the height of the next layer and powder is reapplied. This process continues until the part is complete.



nitration & Infiltration furnace cycle

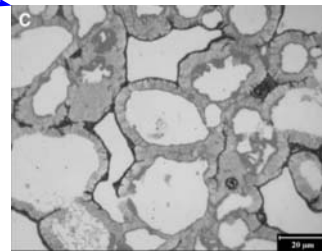
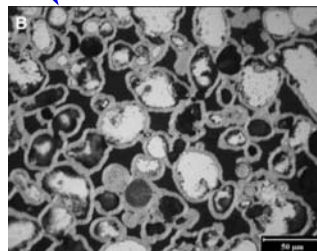
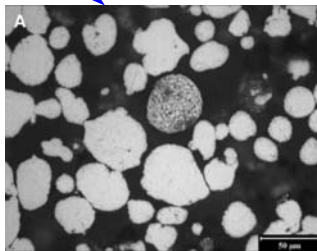


Raw Material Powders

Al 6061-2wt%Mg-1wt%Sn-3wt%Nylon

Fabrication Process

- 1) A resin bonded part is formed using SLS (Figure A).
- 2) The binder is thermally removed and the Al 6061 particles are partially transformed to an interconnected AlN skeleton (Figure B).
- 3) The part is infiltrated by an Al alloy in order to achieve nearly full density and desired mechanical properties (Figure C).



Microstructures of the parts in different fabrication stages: (a) after SLS, (b) after nitration and (c) after infiltration

Examples of industrial applications

