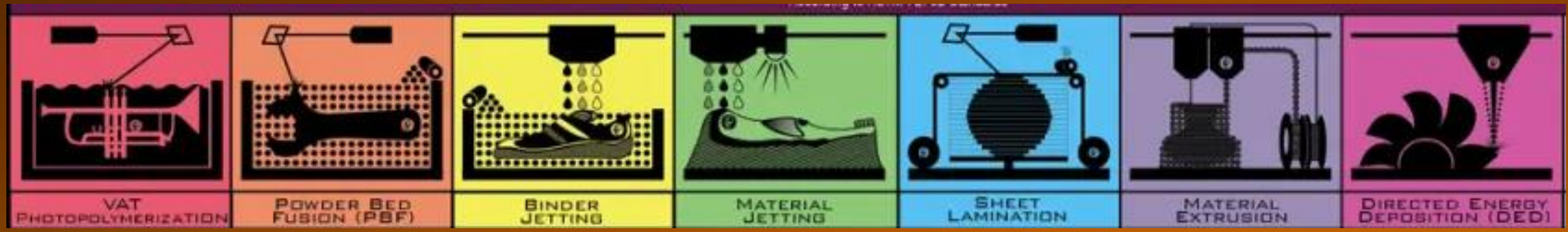
APRESENTAÇÃO

DOS PROCESSOS ADITIVOS



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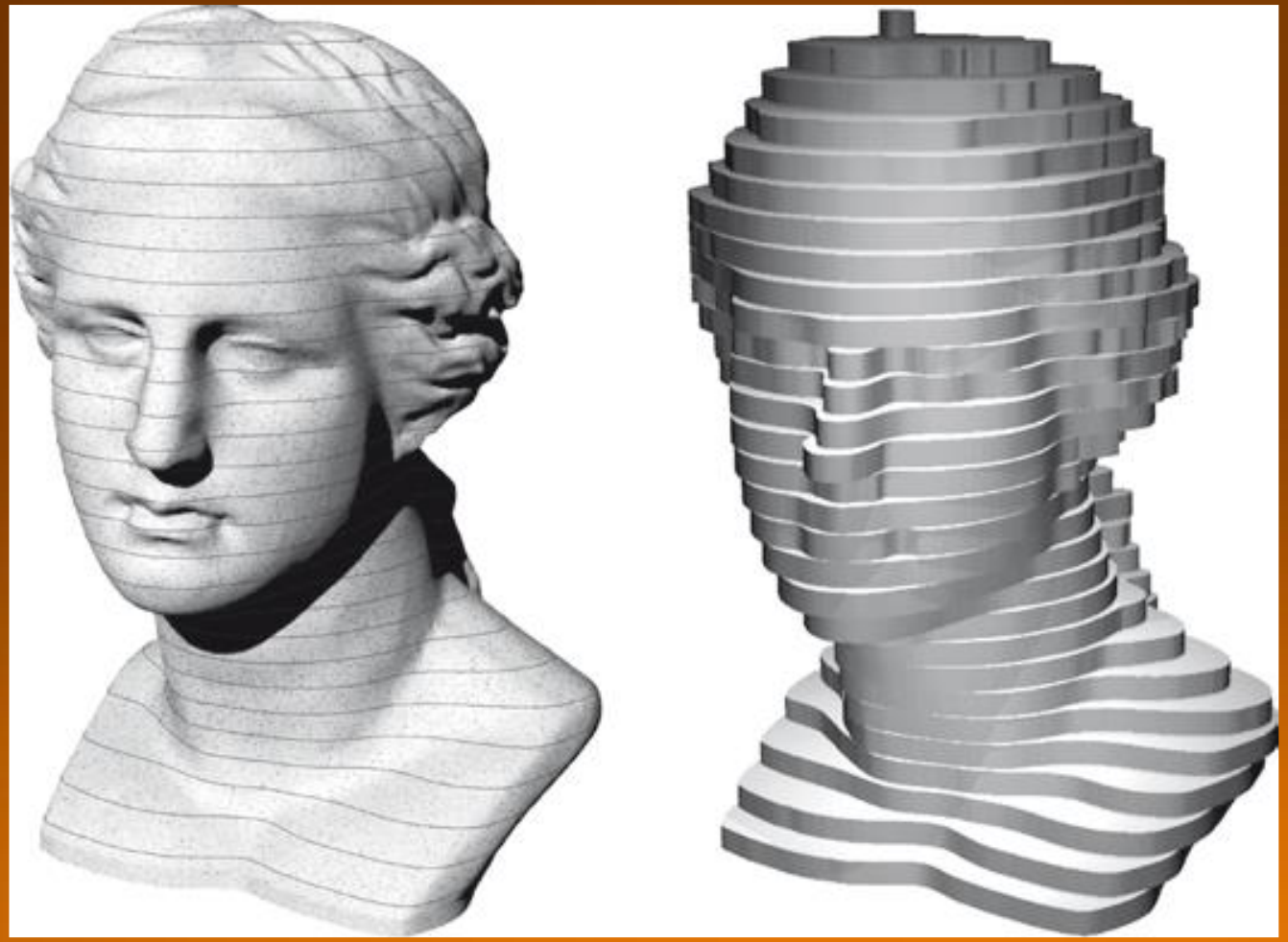
MANUFATURA ADITIVA

- 3D Printing
- Fabricação de corpos tridimensionais usando apenas dados virtuais, camada por camada, o mais próximo possível das dimensões finais

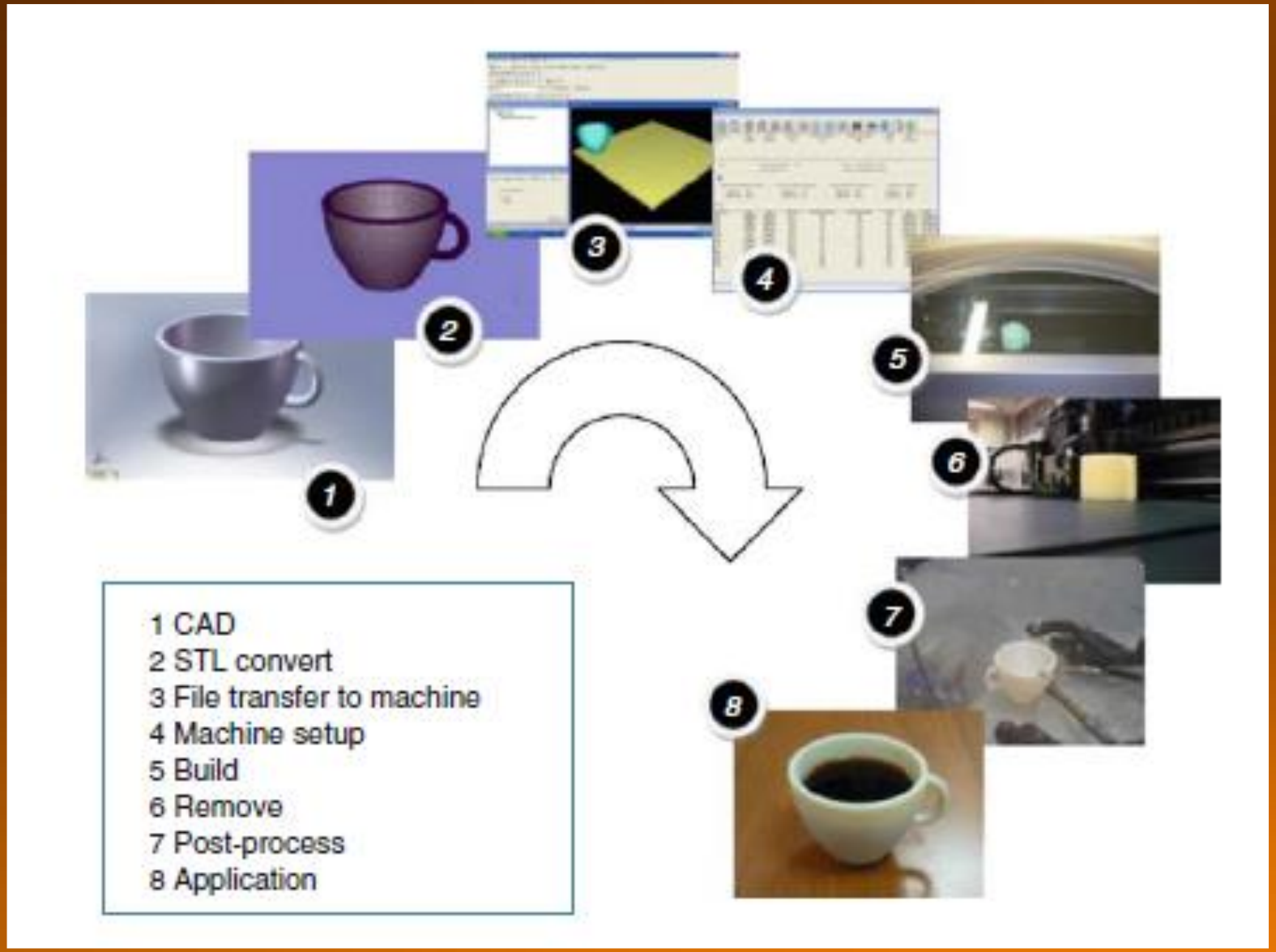
MANUFATURA ADITIVA

Fases de trabalho e planejamento de processo

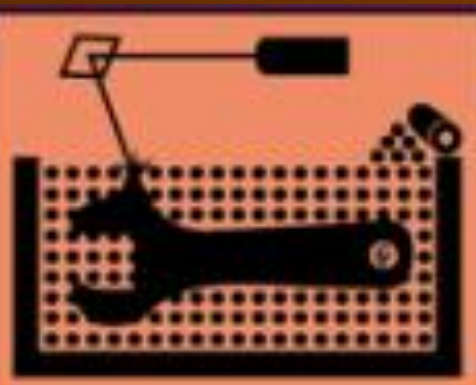


Material Extrusion

FDM = FUSED DEPOSITION METHOD



PROCESSOS DE MANUFATURA ADITIVA

			
VAT PHOTOPOLYMERIZATION	**POWDER BED FUSION (PBF)**	**BINDER JETTING**	**MATERIAL JETTING**
Alternative Names: SLA™ - Stereolithography Apparatus DLP™ - Digital Light Processing 3SP™ - Scan, Spin, and Selectively Photocure CLIP™ – Continuous Liquid Interface Production	**Alternative Names:** SLS™ - Selective Laser Sintering; DMLS™ - Direct Metal Laser Sintering; SLM™ - Selective Laser Melting; EBM™ - Electron Beam Melting; SHS™ - Selective Heat Sintering MJF™ - Multi-Jet Fusion	**Alternative Names:** 3DP™ - 3D Printing ExOne Voxeljet	**Alternative Names:** Polyjet™ SCP™ - Smooth Curvatures Printing MJM - Multi-Jet Modeling Projet™
Description: A vat of liquid photopolymer resin is cured through selective exposure to light (via a laser or projector) which then initiates polymerization and converts the exposed areas to a solid part	**Description:** Powdered materials is selectively consolidated by melting it together using a heat source such as a laser or electron beam. The powder surrounding the consolidated part acts as support material for overhanging features	**Description:** Liquid bonding agents are selectively applied onto thin layers of powdered material to build up parts layer by layer. The binders include organic and inorganic materials. Metal or ceramic powdered parts are typically fired in a furnace after they are printed	**Description:** Droplets of material are deposited layer by layer to make parts. Common varieties include jetting a photocurable resin and curing it with UV light, as well as jetting thermally molten materials that then solidify in ambient temperatures
Strengths: • High level of accuracy and complexity • Smooth surface finish • Accommodates large build areas	**Strengths:** • High level of complexity • Powder acts as support material • Wide range of materials	**Strengths:** • Allows for full color printing • High productivity • Uses a wide range of materials	**Strengths:** • High level of accuracy • Allows for full color parts • Enables multiple materials in a single part
Typical Materials UV-Curable Photopolymer Resins	**Typical Materials** Plastics, Metal and Ceramic Powders, and Sand	**Typical Materials** Powdered Plastic, Metal, Ceramics, Glass, and Sand	**Typical Materials** Photopolymers, Polymers, Waxes

PROCESSOS DE MANUFATURA ADITIVA

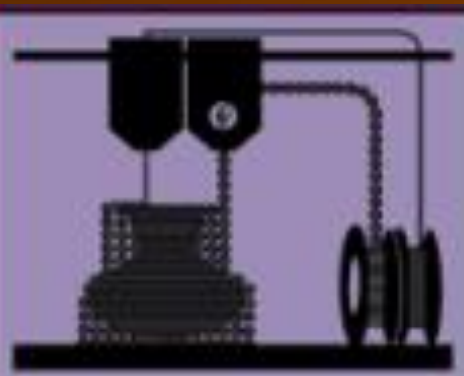
SHEET LAMINATION

Alternative Names:
LOM - Laminated Object Manufacture
SDL - Selective Deposition Lamination
UAM - Ultrasonic Additive Manufacturing

Description:
Sheets of material are stacked and laminated together to form an object. The lamination method can be adhesives or chemical (paper/plastics), ultrasonic welding, or brazing (metals). Unneeded regions are cut out layer by layer and removed after the object is built.

Strengths:
- High volumetric build rates
- Relatively low cost (non-metals)
- Allows for combinations of metal foils, including embedding components

Typical Materials
Paper, Plastic Sheets, and Metal Foils/Tapes



MATERIAL EXTRUSION

Alternative Names:
FFF - Fused Filament Fabrication
FDM™ - Fused Deposition Modeling

Description:
Material is extruded through a nozzle or orifice in tracks or beads, which are then combined into multi-layer models. Common varieties include heated thermoplastic extrusion (similar to a hot glue gun) and syringe dispensing.

Strengths:
- Inexpensive and economical
- Allows for multiple colors
- Can be used in an office environment
- Parts have good structural properties

Typical Materials
Thermoplastic Filaments and Pellets (FFF); Liquids, and Slurries (Syringe Types)

DIRECTED ENERGY DEPOSITION (DED)

Alternative Names:
LMD - Laser Metal Deposition
LENS™ - Laser Engineered Net Shaping

Description:
Powder or wire is fed into a melt pool which has been generated on the surface of the part where it adheres to the underlying part or layers by using an energy source such as a laser or electron beam. This is essentially a form of automated build-up welding.

Strengths:
- Not limited by direction or axis
- Effective for repairs and adding features
- Multiple materials in a single part
- Highest single-point deposition rates

Typical Materials
Metal Wire and Powder, with Ceramics

HYBRID

Alternative Names:
AMBIT™ - Created by Hybrid Manufacturing Technologies

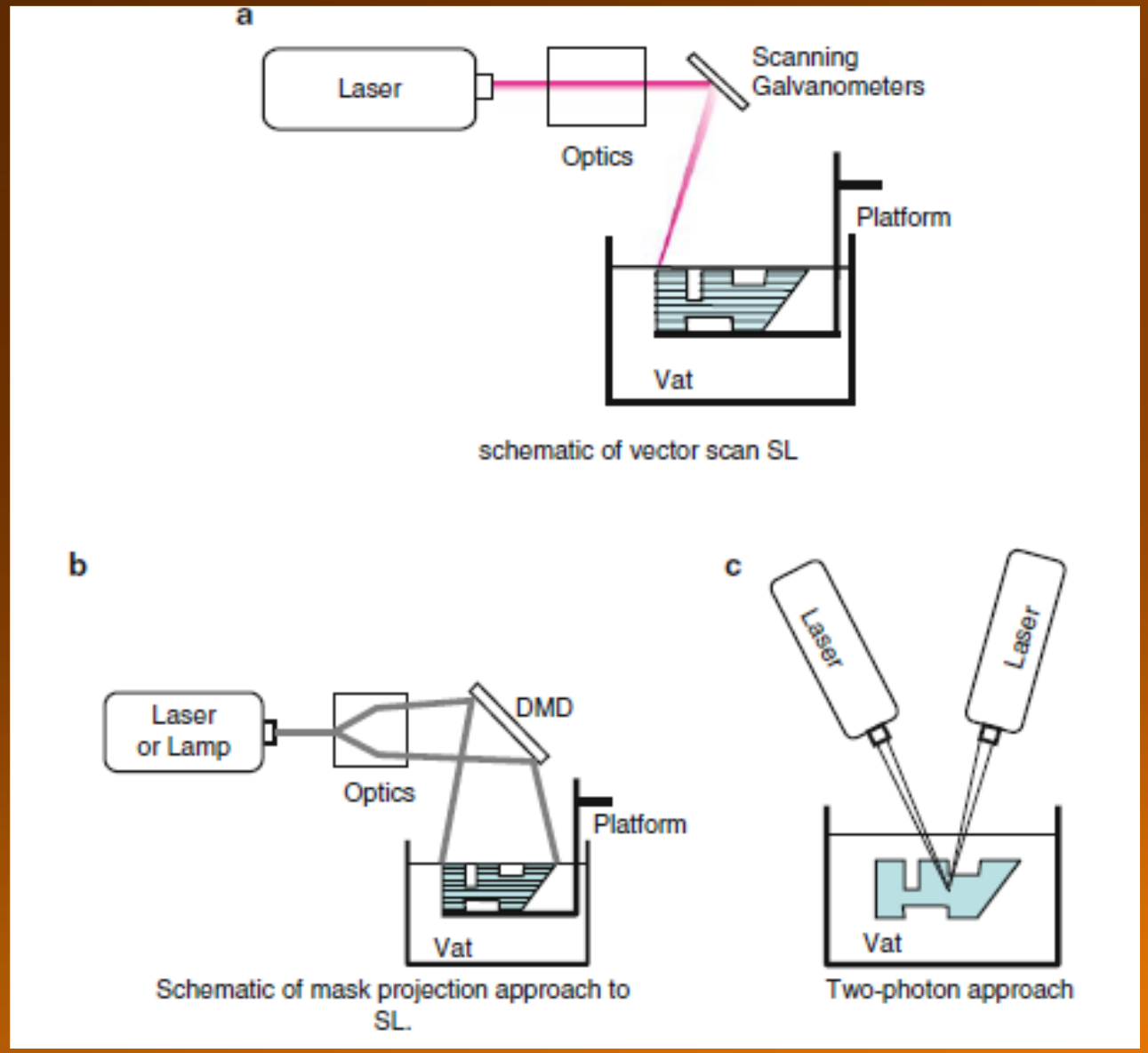
Description:
Laser metal deposition (a form of DED) is combined with CNC machining, which allows additive manufacturing and 'subtractive' machining to be performed in a single machine so that parts can utilize the strengths of both processes.

Strengths:
- Smooth surface finish AND High Productivity
- Geometrical and material freedoms of DED
- Automated in-process support removal, finishing, and inspection

Typical Materials
Metal Powder and Wire, with Ceramics

PHOTOPOLYMERIZATION

Stereolithography (SL) technology



Selective Polymerization (one beam)

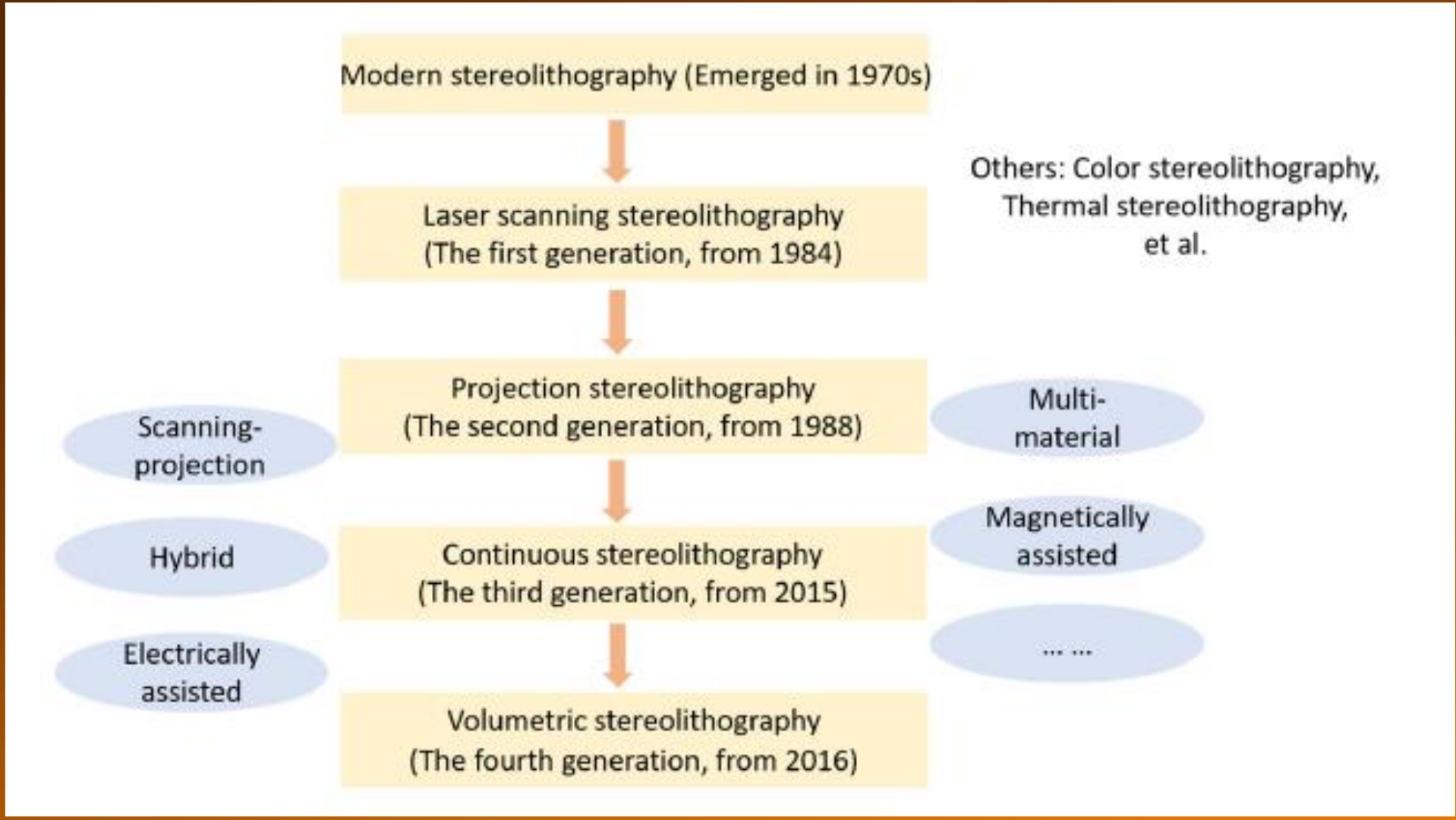
Layer Polymerization

Selective Polymerization (two beams)

PHOTOPOLYMERIZATION

Stereolithography (SL) technology

Evolução histórica



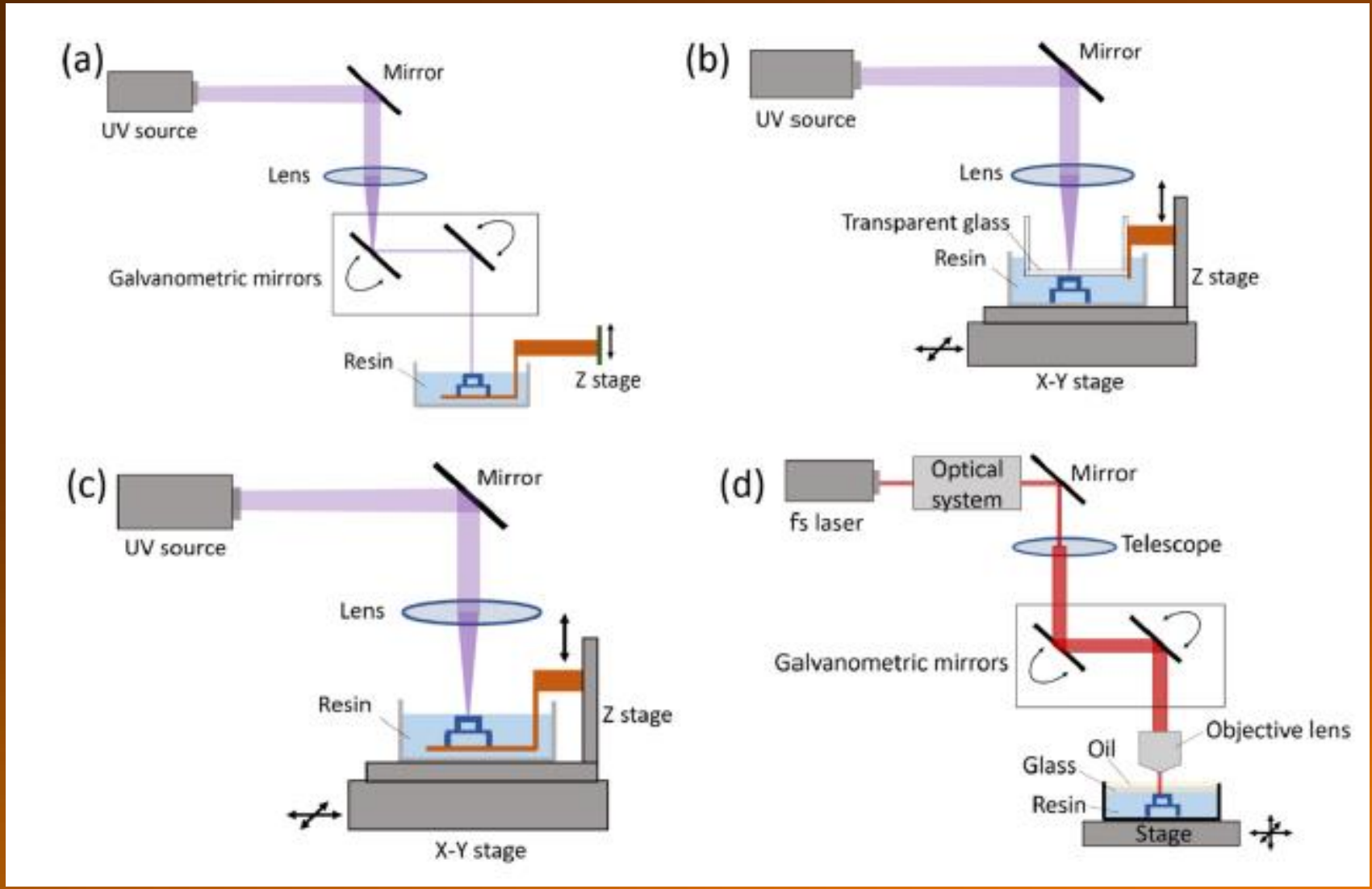
PHOTOPOLYMERIZATION

Stereolithography (SL) technology

Máquinas existentes

Plataforma sobe, espelhos movem

Plataforma sobe, mesa se move



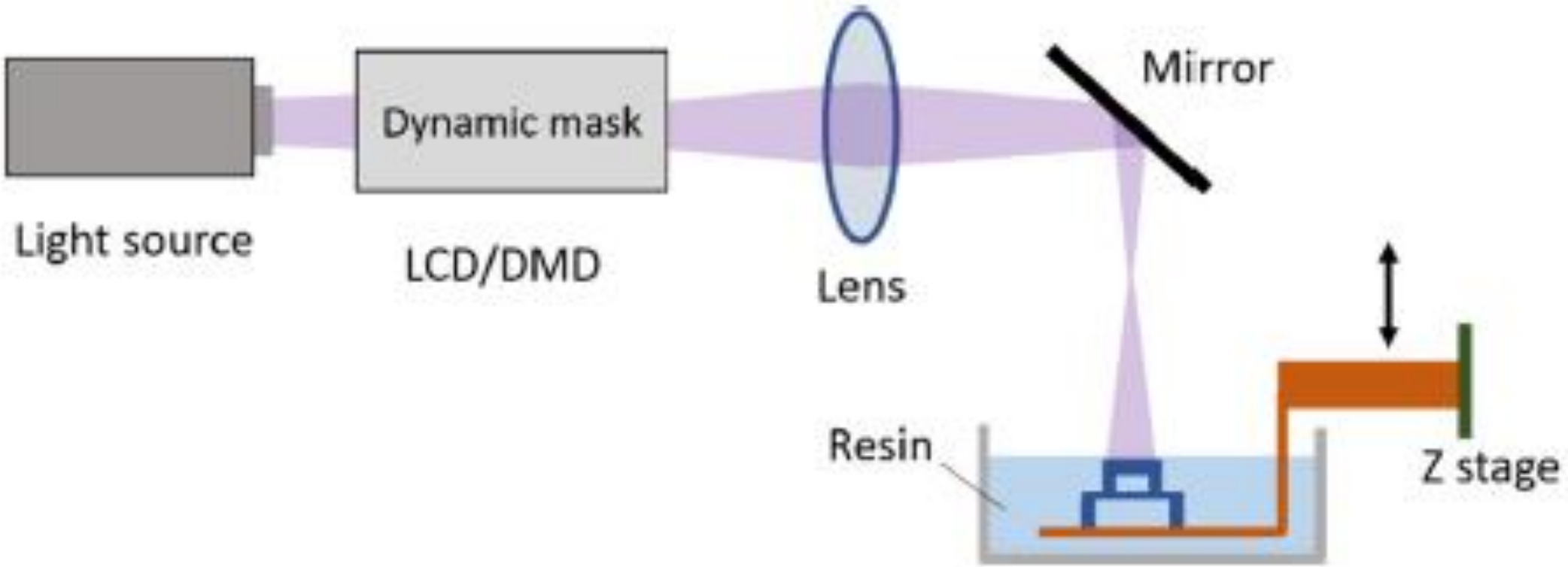
Plataforma sobe, mesa transparente se move

Lasers de 2 frequências, Mesa se move 3D

PHOTOPOLYMERIZATION

Stereolithography (SL) technology

Máquinas existentes



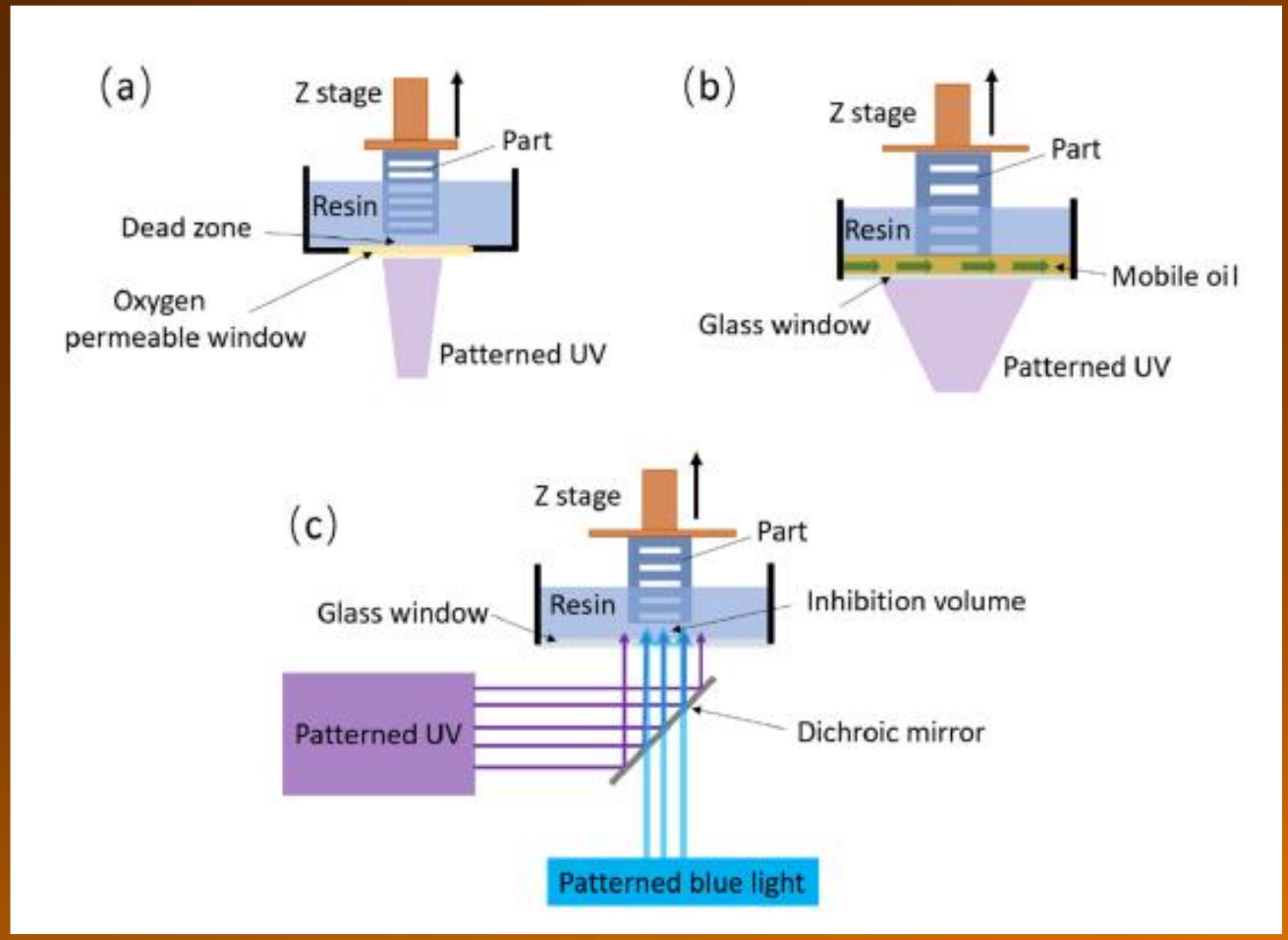
Máquina com polimerização por máscara

PHOTOPOLYMERIZATION

Stereolithography (SL) technology

Máquinas existentes

Continuous liquid interface production (CLIP)



High-area rapid printing (HARP) system

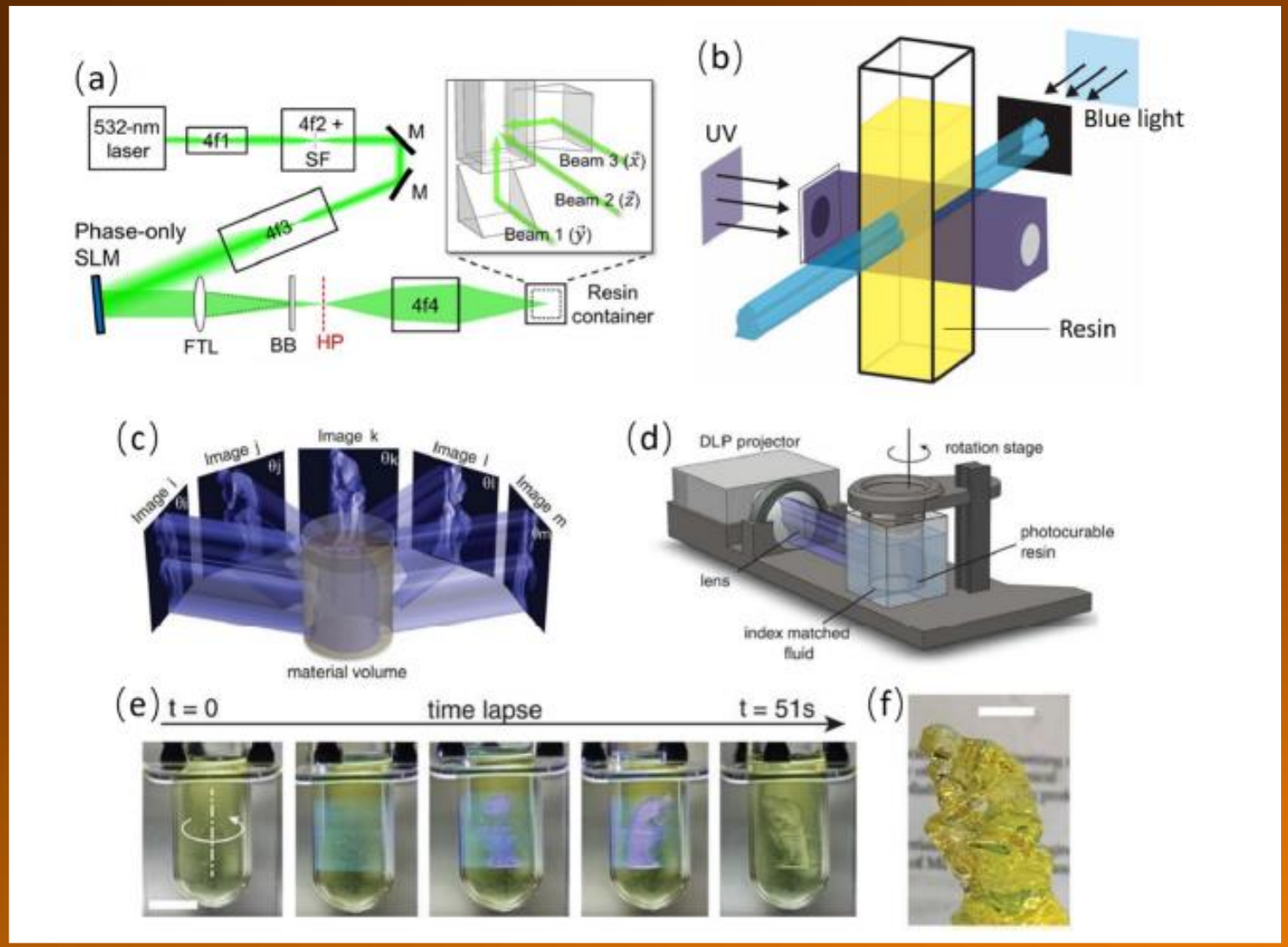
Continuous stereolithography with dual-wavelength irradiation

Máquina com polimerização por máscara

PHOTOPOLYMERIZATION

Stereolithography (SL) technology

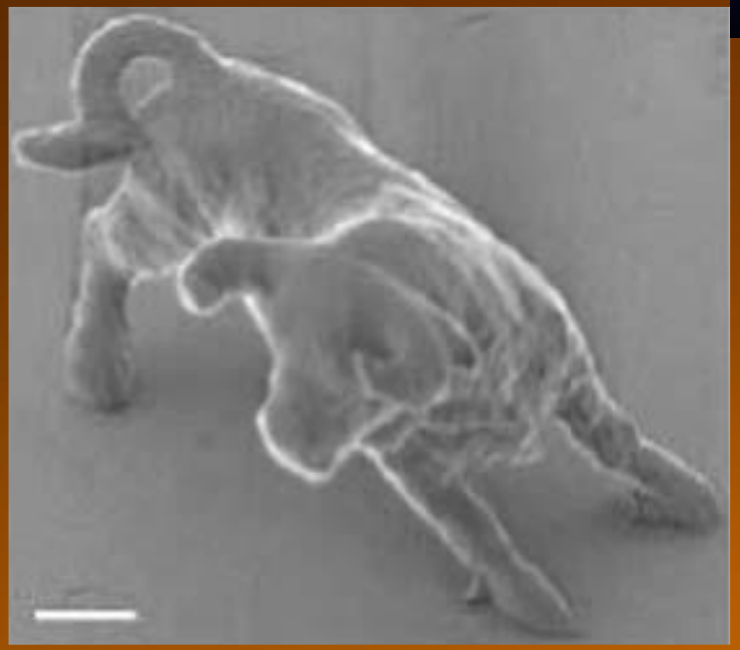
Novos sistemas SLA



PHOTOPOLYMERIZATION

Stereolithography (SL) technology

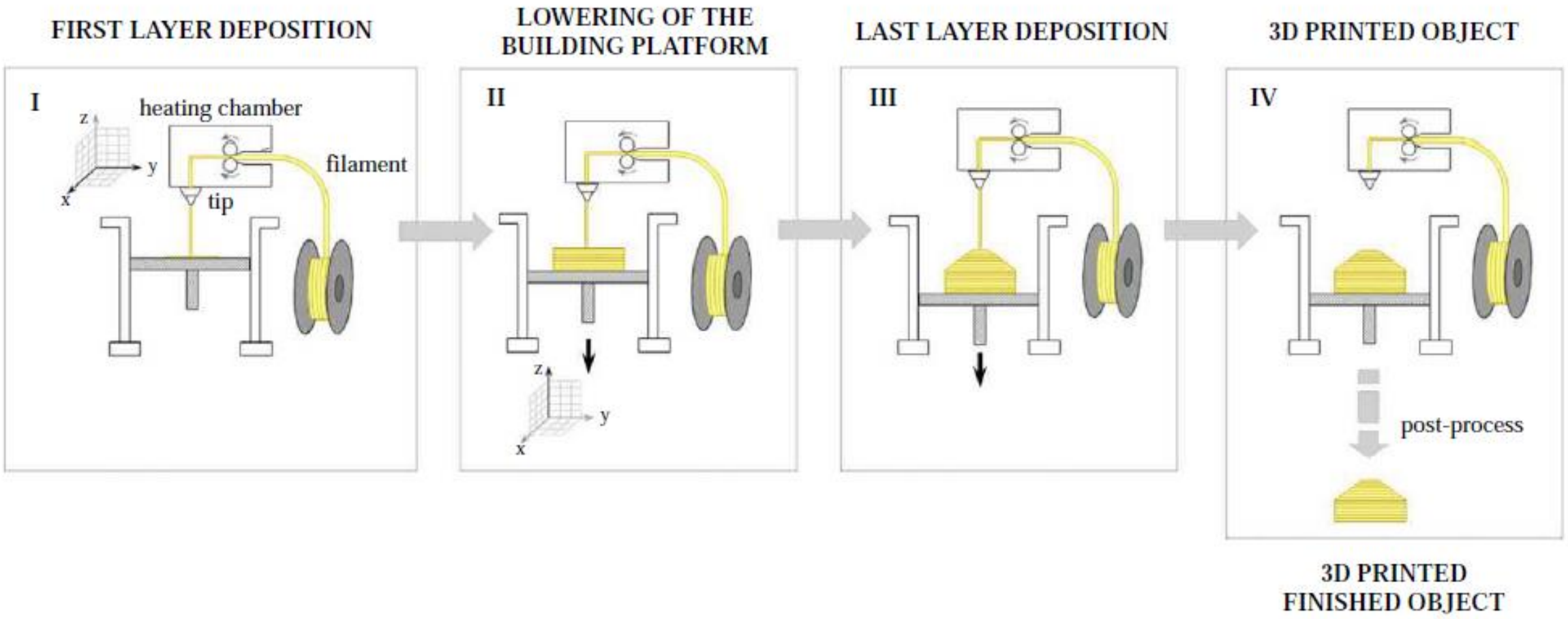
Exemplos



PHOTOPOLYMERIZATION

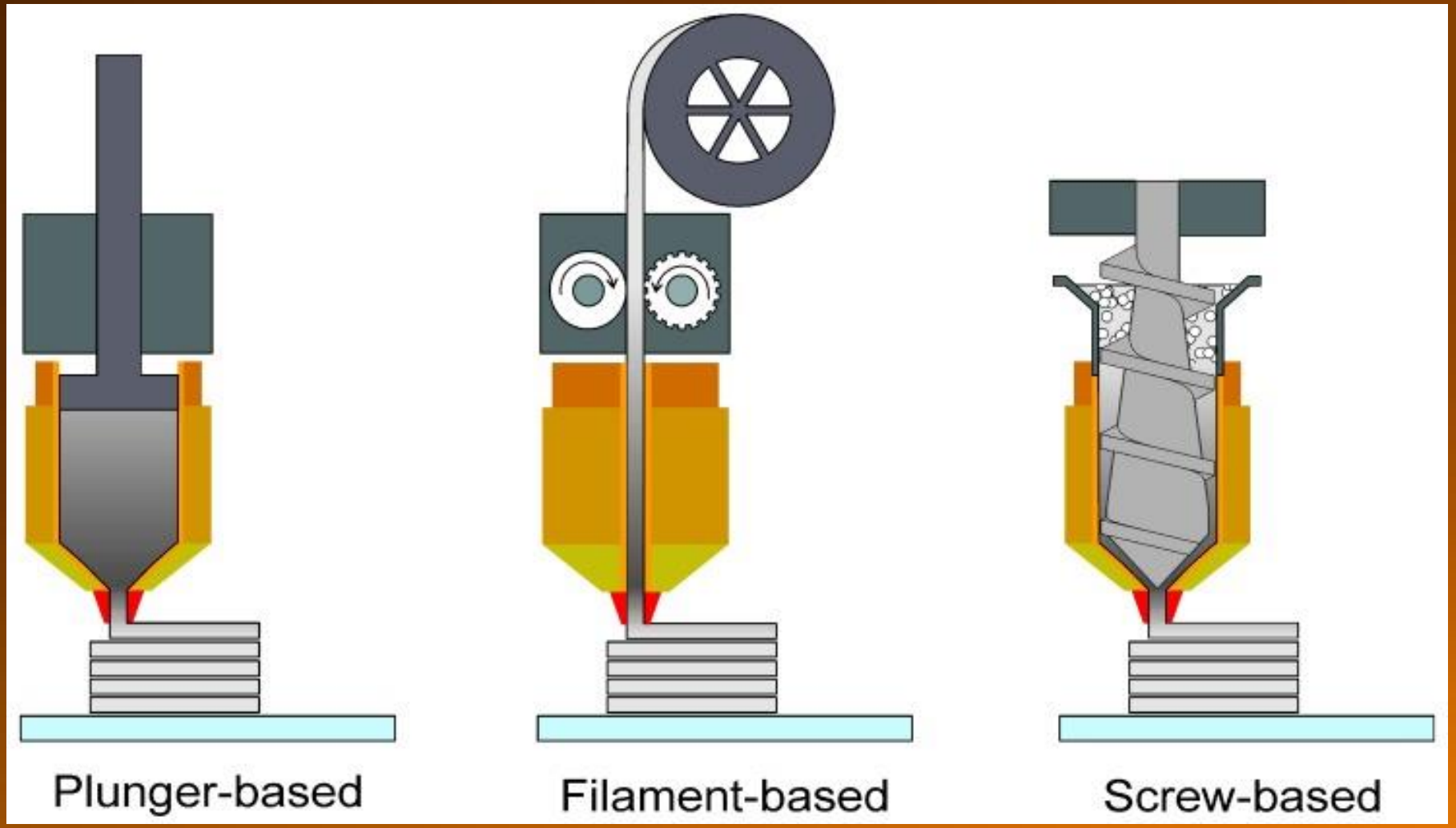
Stereolithography (SL) technology

FDM = FUSED DEPOSITION METHOD



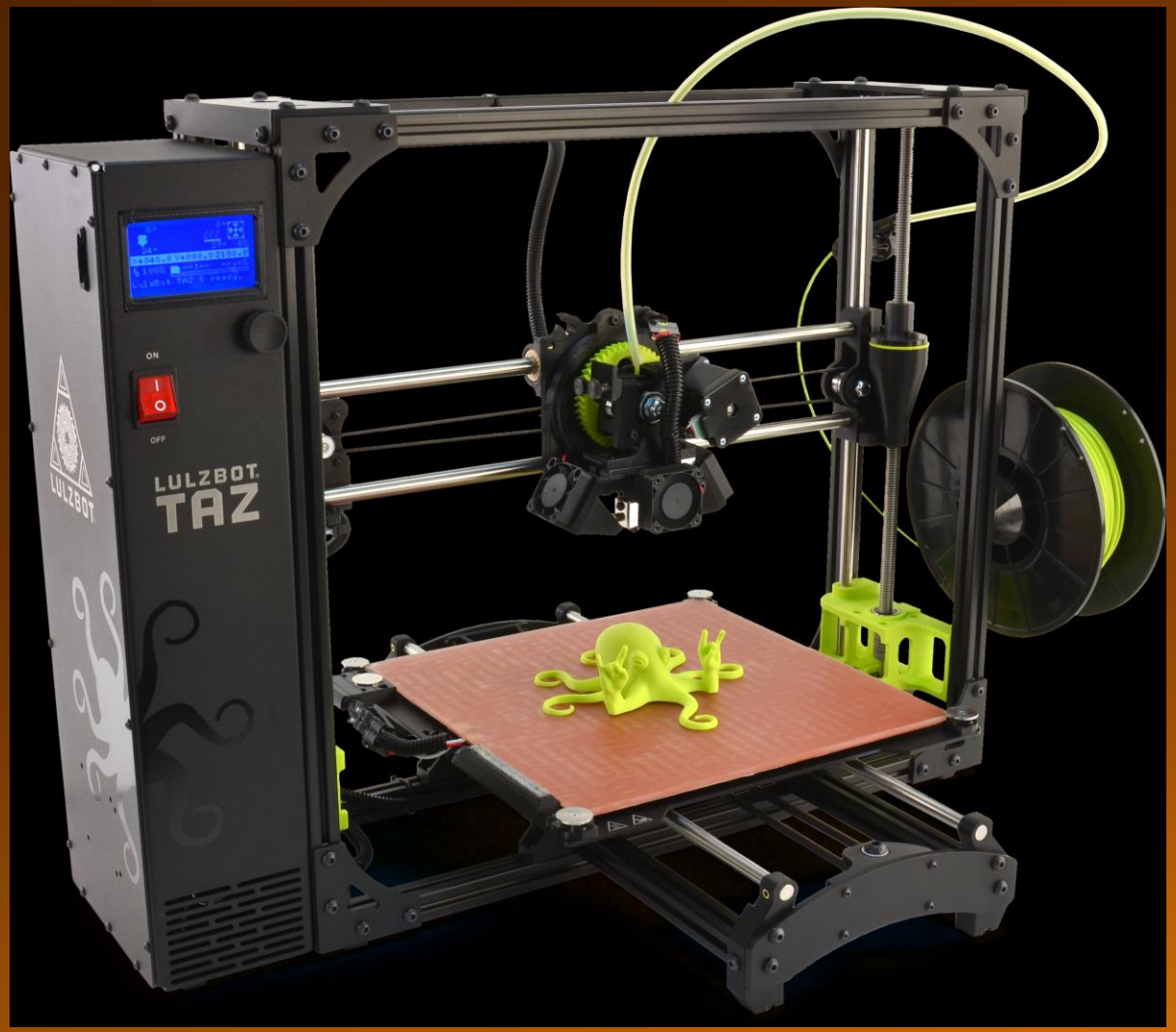
FDM = FUSED DEPOSITION METHOD

Deposition heads

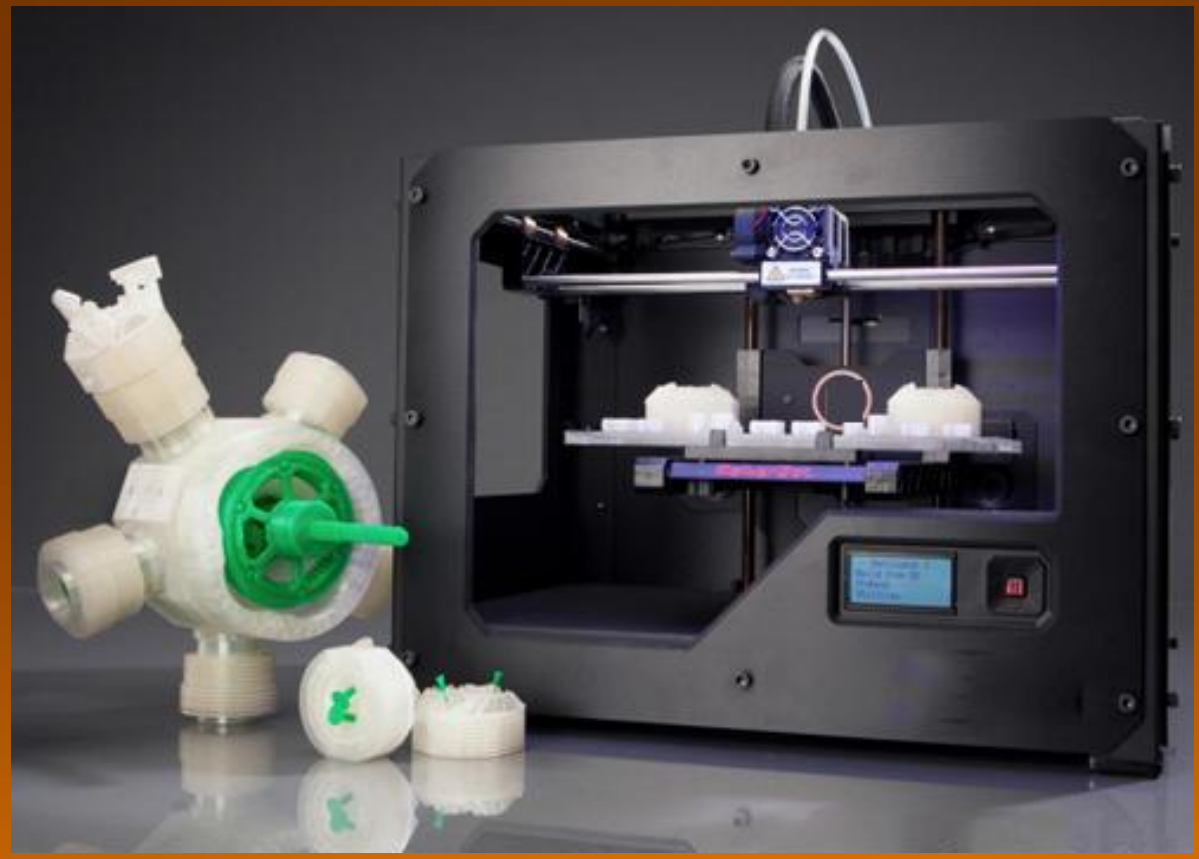


PROCESSOS DE MANUFATURA ADITIVA

FDM = FUSED DEPOSITION METHOD



Lay out de máquinas existentes



PROCESSOS DE MANUFATURA ADITIVA

FDM = FUSED DEPOSITION METHOD

Lay out de máquinas existentes

PROCESSOS DE MANUFATURA ADITIVA

FDM = FUSED DEPOSITION METHOD

Exemplos