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Progress in selective laser melting equipment, related biomedical metallic materials and applications

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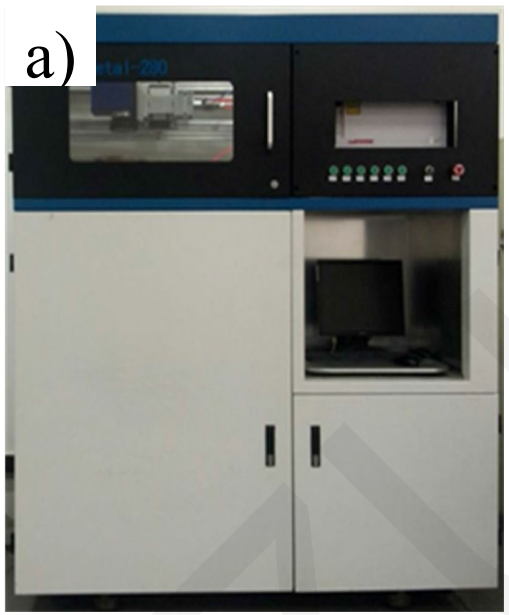
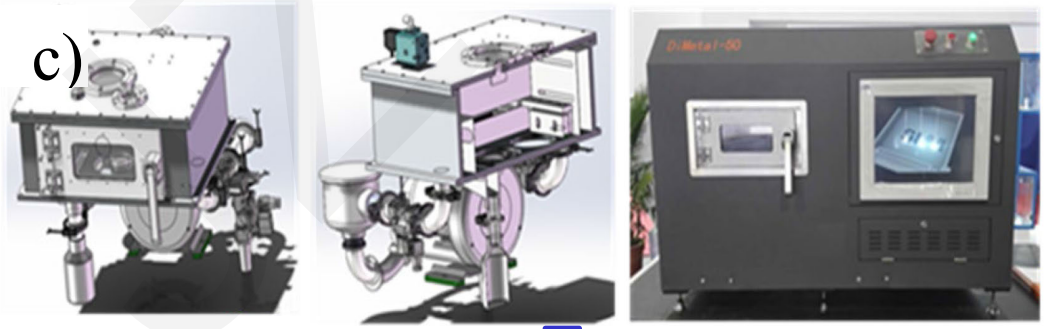
DiMetal Series equipments

DiMetal-280

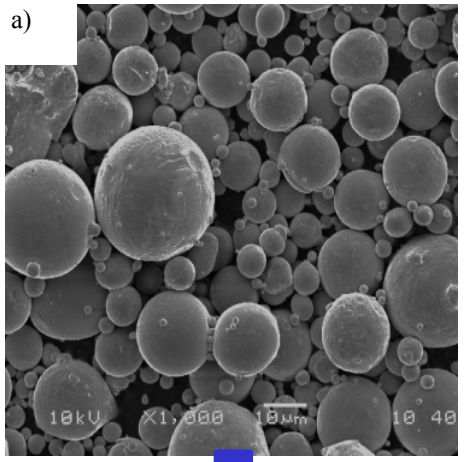


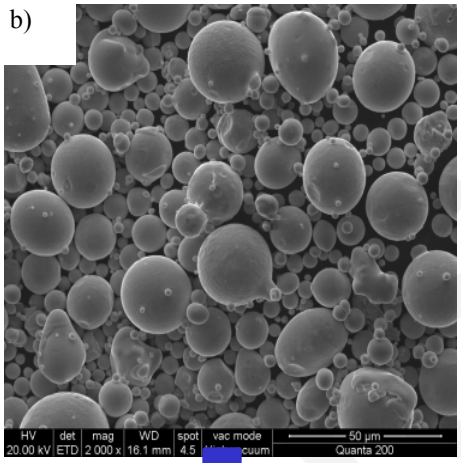
DiMetal-100

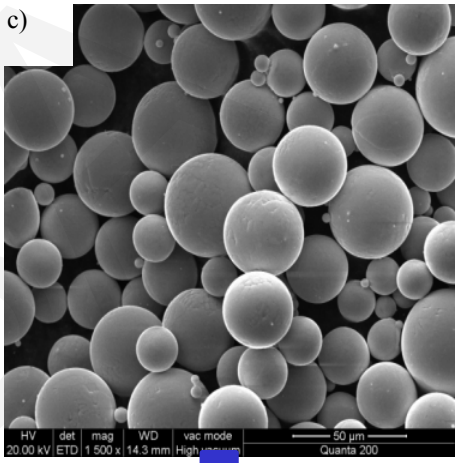


DiMetal-50

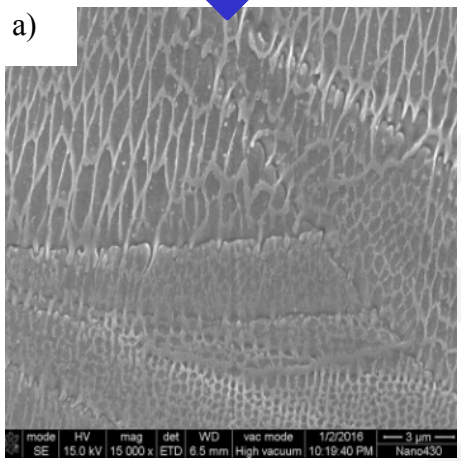
Biomedical metallic materials

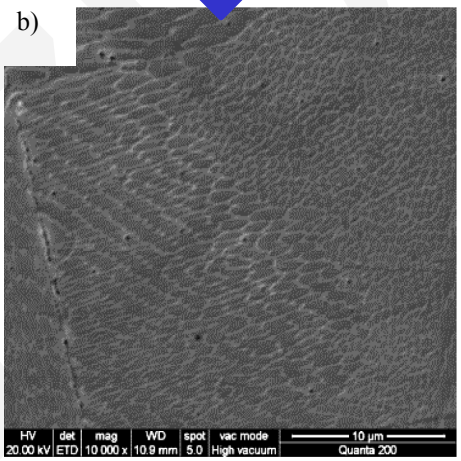


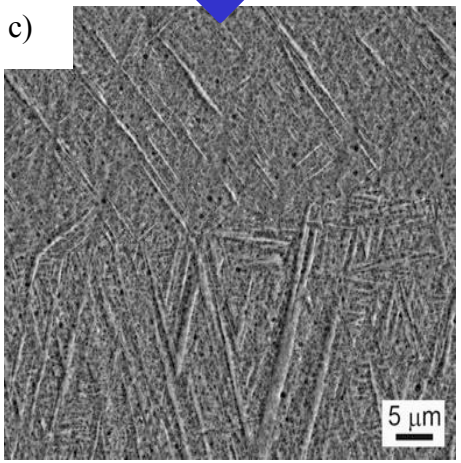




Powder







Part

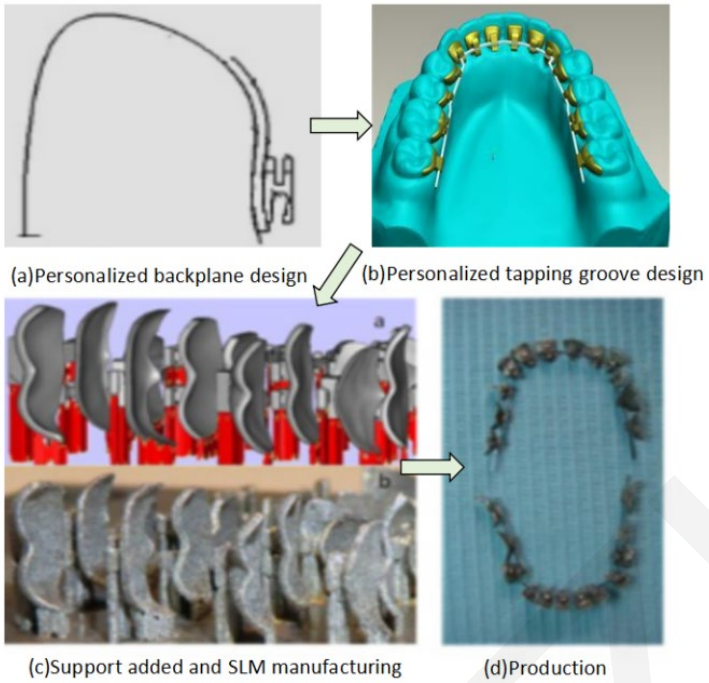
(a) 316L stainless steel (b) CoCrMo alloy (c) Ti6Al4V alloy

Mechanical properties

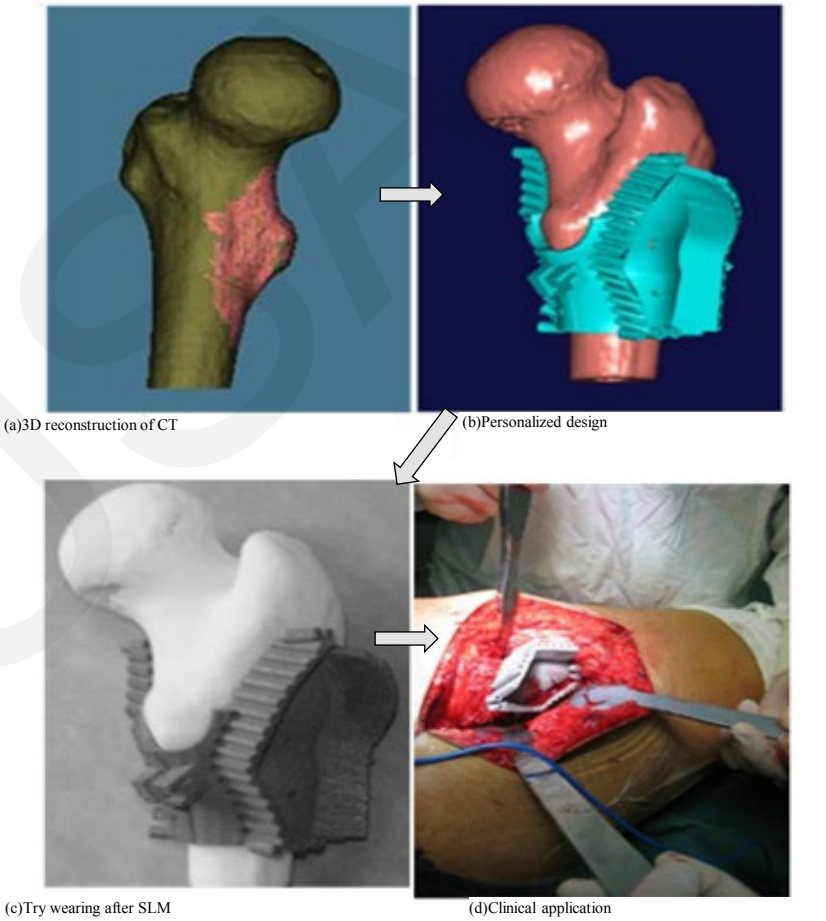
Tab.1 A comparison of the properties of metal parts manufactured by SLM with ASTM and the casting standard (316L stainless steel, CoCrMo and Ti6Al4V)

Material category		Yield strength / MPa	Tensile strength /MPa	Elongation/%	Elastic modulus /GPa	Rockwell hardness /HRC
316L stainless steel	ASTM F138	190	490	40	210	22.2
	Casting	≥175	≥480	40	195	19
	SLM manufacturing	480	600	30	200	23
CoCrMo alloy	ASTM F75	450	655	＞8	240	25
	Casting	620	845	10	220	33
	SLM manufacturing	689	970	3.1	230	40
	SLM with heat treatment	568	815	10.2	220	37
Ti6Al4V	ASTM F136	860	795	10	110	-
	Casting	976	847	5.1	114	-
	SLM manufacturing	1125	1250	6	94	41
	SLM with heat treatment	950	1005	12	115	37

Applications of SLMed 316L

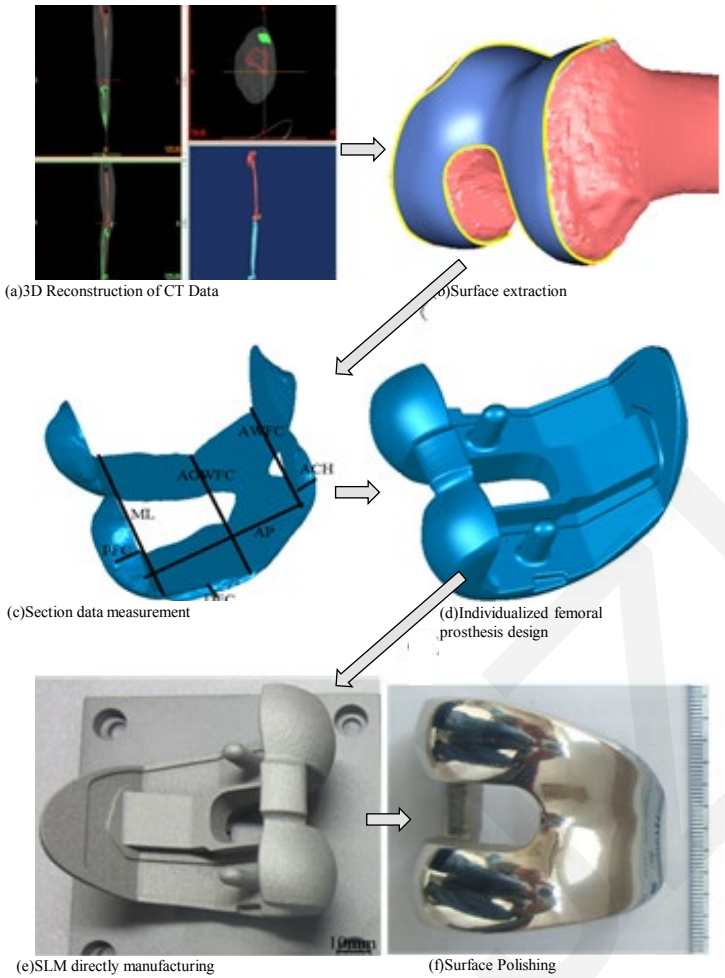


Personalized brackets

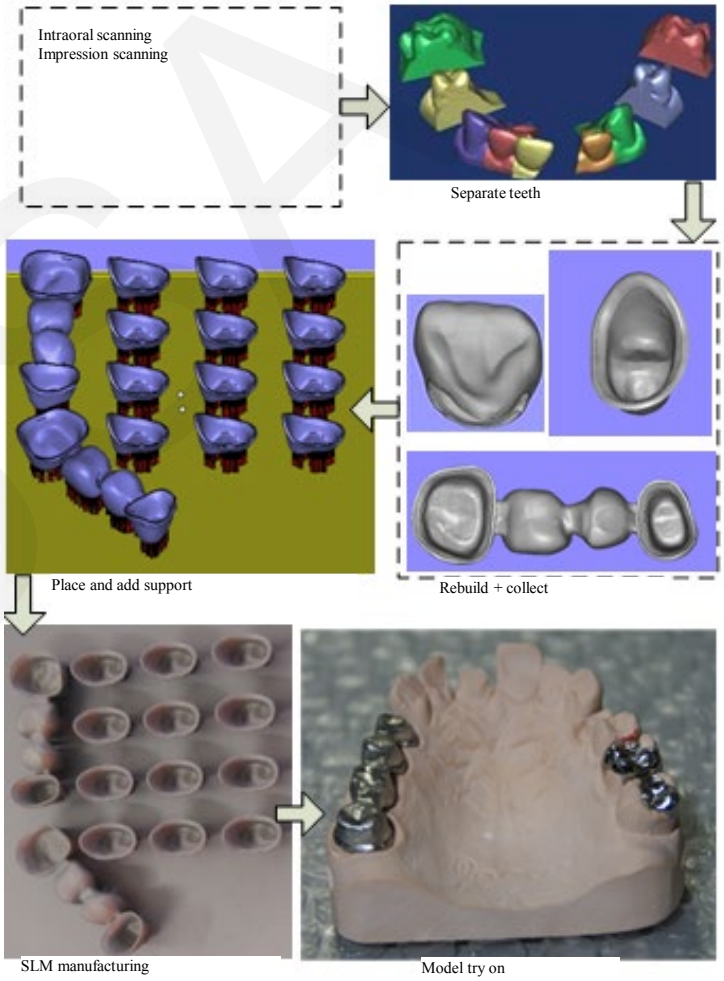


Personalized surgical guide

Applications of SLMed CoCrMo

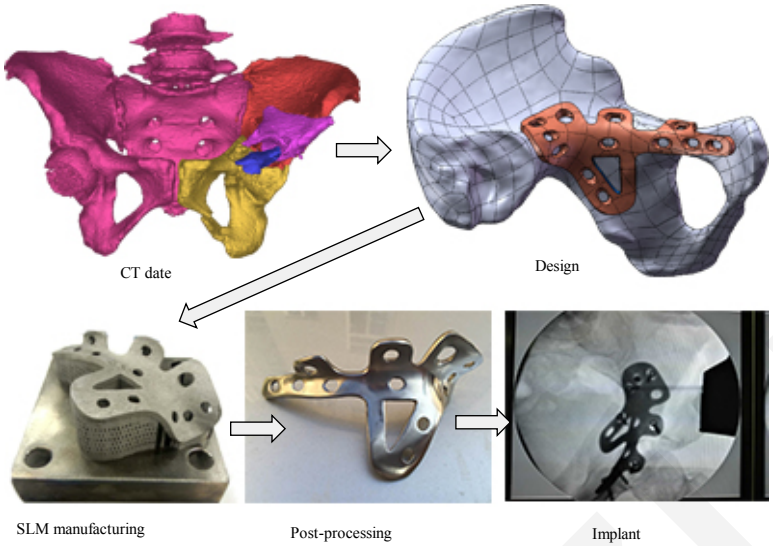


Personalized knee prostheses

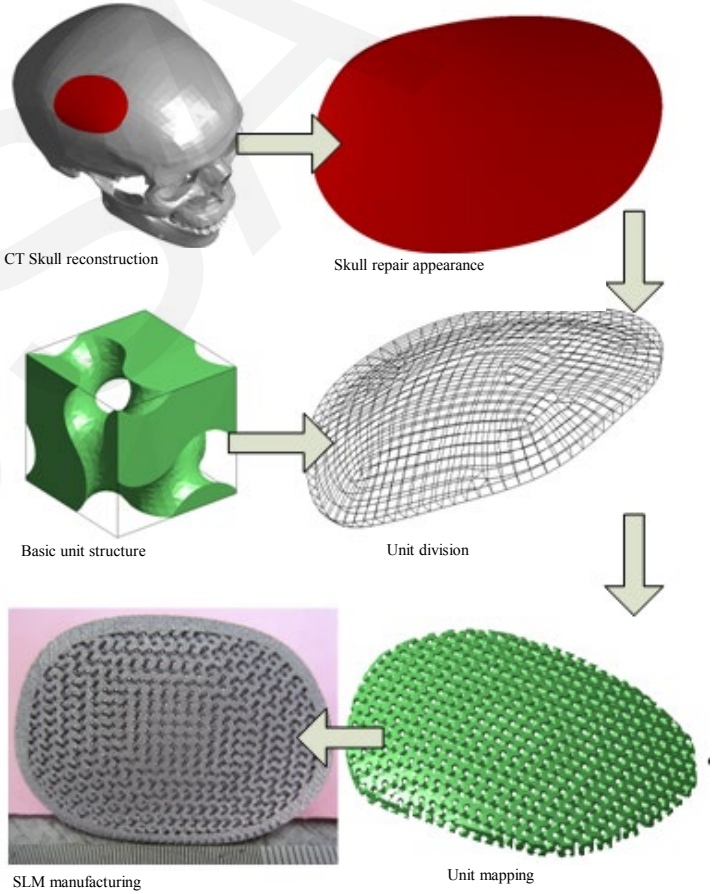


Personalized dental crown and bridge

Applications of SLMed Ti6Al4V

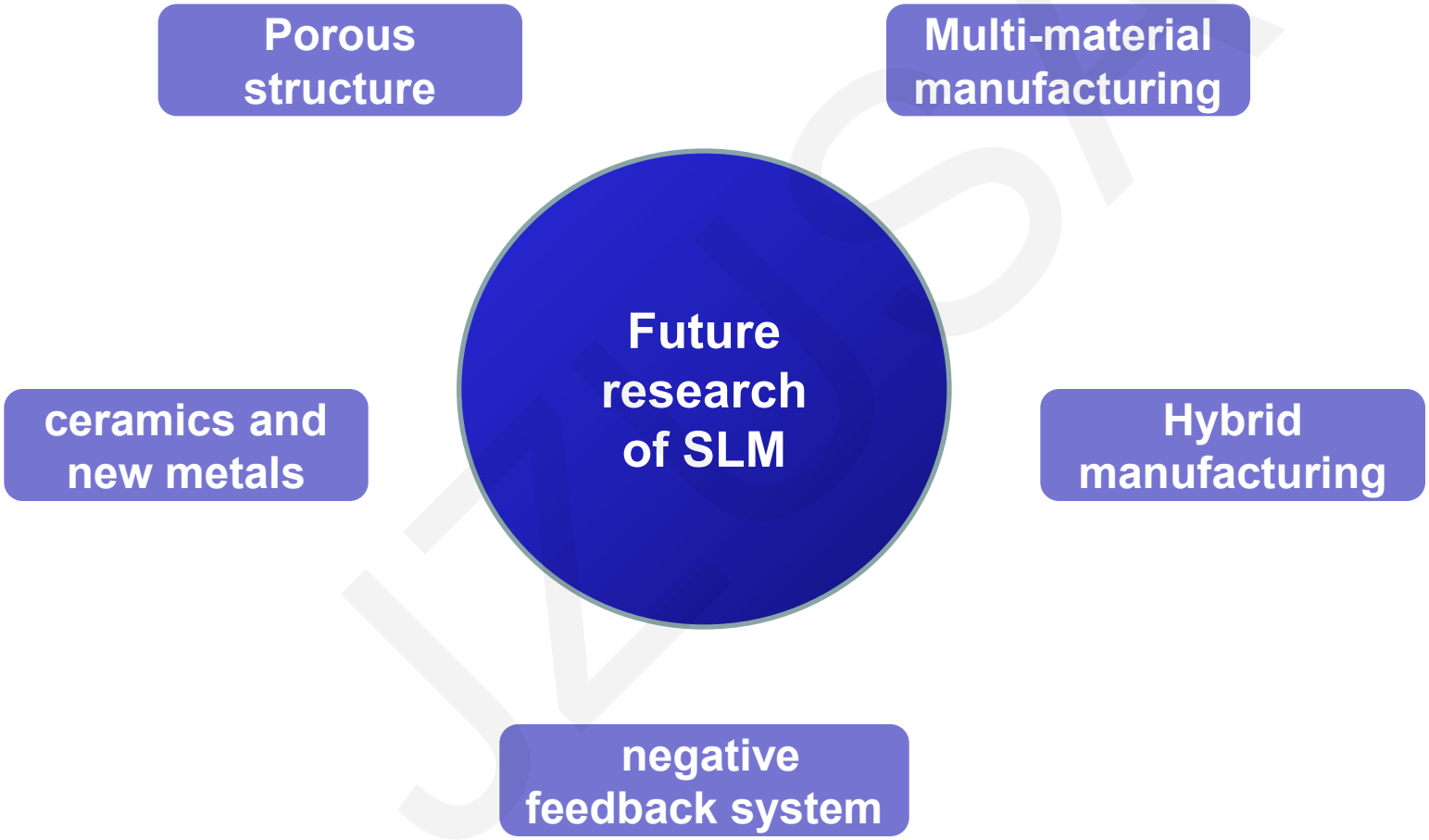


Personalized bone plate



Personalized porous skull restoration

Future research



Conclusions

- The South China University of Technology has conducted a detailed long-term study of SLM equipment and its applications in medicine, studies the SLM manufacturing process and the microstructure of biomedical metal materials of 316L stainless steel, CoCrMo alloy and Ti6Al4V alloy, and obtained parts with outstanding performance.
- At present, researchers at SCUT are beginning to study the design and manufacturing technology of porous structure, SLM multi-material manufacturing and SLM + cutting complex manufacturing. And SCUT has begun the development of an SLM equipment negative feedback system and research on the ceramic SLM manufacturing process.