Study on Microstructure Control and Performance Optimization of ZCuPb20Sn5 Alloy by Rare Earth La

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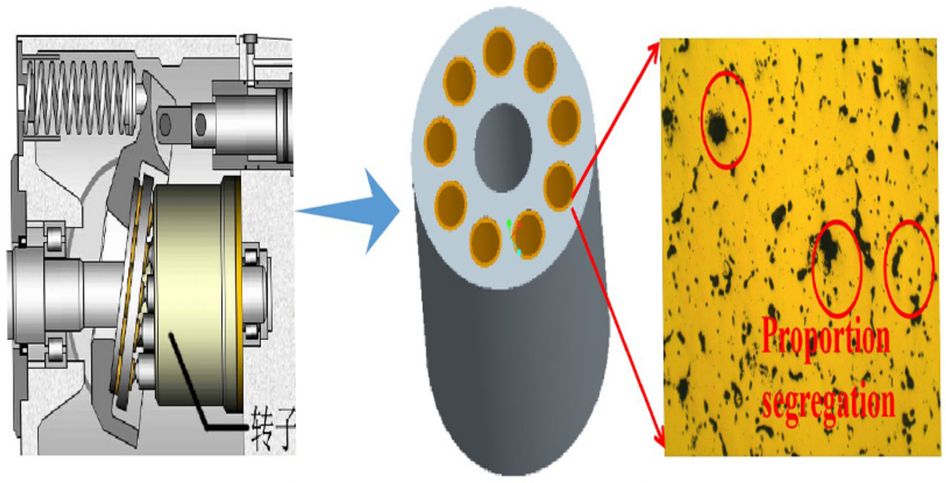
Application Beakground



Due to the difference in density between lead and copper, the specific gravity segregation of lead is easy to occur during solidification,which leads to the instability of alloy properties.

Experimental

Table 1.1 Chemical Composition of $ZCuPb_{20}Sn_5$ Alloy

Element	Cu	Pb	P	Zn	Sn	Ni	La
Content（*w*）	bal.	20	0（0.3）	1.75	5	2	0-0.2

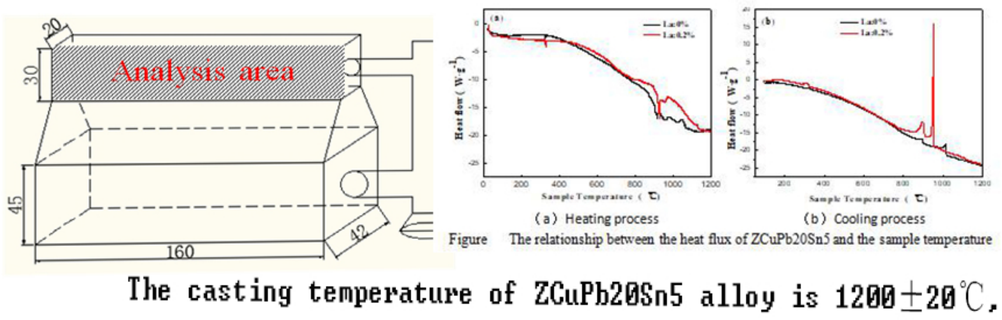
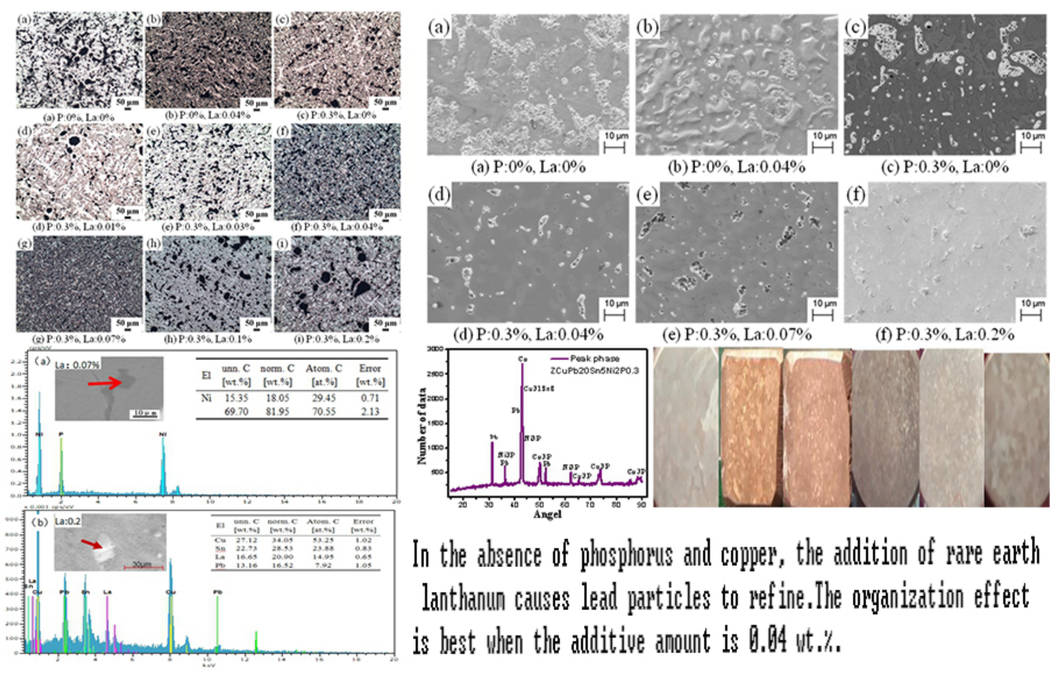


Figure The relationship between the heat flux of ZCuPb20Sn5 and the sample temperature

The casting temperature of ZCuPb20Sn5 alloy is 1200±20℃, and the casting test block is a copper alloy metal mold casting test block. Please refer to the national standard GB/T 1176-2013. The etching solution is continuous hydrogen peroxide, ammonia and water in a ratio of 1:1:1.

Purify the organization and improve the degree of segregation

Micro characterization

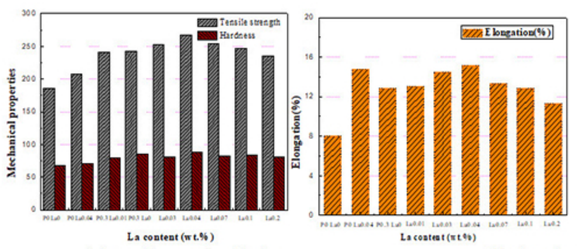


In the absence of phosphorus and copper, the addition of rare earth lanthanun causes lead particles to refine.The organization effect is best when the additive amount is 0.04 wt.%.

Mechanical properties

Table2.1 Mechanical properties of ZCuPb20Sn5 alloy under different conditions

Factor	Ni(%)	P (%)	La (%)	Tensile strength Rm/ MPa	Elongation A/%	hadness HB
1	3	0	0	185.6	8.0	67.2
2	3	0	0.04	207.5	14.8	71.1
3	2	0.3	0	241.5	12.8	79.6
4	2	0.3	0.01	242.3	13.0	85.5
5	2	0.3	0.03	252.6	14.5	80.2
6	2	0.3	0.04	267.1	15.1	87.7
7	2	0.3	0.07	253.7	13.3	82.6
8	2	0.3	0.1	247.0	12.8	83.2
9	2	0.3	0.2	235.4	11.3	81.2



（a）Tensile strength and hadness (b) Elongation

Figure Histogram of mechanical properties of ZCuPb20Sn5 alloy

Without the addition of lanthanum, the tensile strength of lead-tin bronze can reach about 241.5 MPa When 0.04 wt.% rare earth lanthanum was added, the tensile strength was 267.1Mpa, the elongation was 15.13%, and the hardness was 80HBW.

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