LSP Series ～ Highly Durable Lead-free solder paste ～

Residue Crack Prevention　Halogen Free

Due to high functionality and electronic controls of automotive features, highly durable solder joint is a must. Considering all usage conditions, a new lead-free solder alloy (LSP) with superior durability performance is developed.

Characteristics

- High joint reliability at harsh installation conditions
- High durability on different boards （glass epoxy/flexible/metal）
- High reliability after soldering, required for automotive applications
- No flux residue crack, and no whisker generation due to complete halogen free

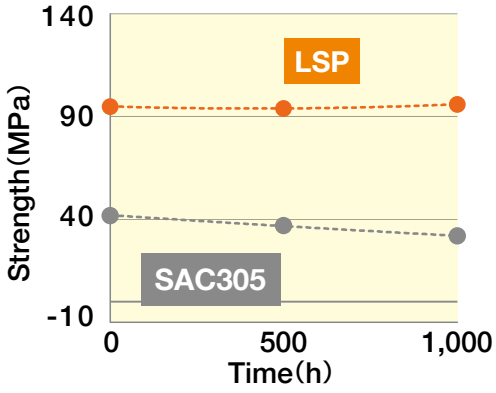
Alloy Composition <Patented>

- Two times stronger than SAC305
- No deterioration of strength at 150℃

	LSP	SAC305
Composition	Sn-3.2Ag-0.5Cu-4.0Bi -3.5Sb-Ni+Co	Sn-3.0Ag-0.5Cu
Melting point	223℃	219℃
Strength	**95MPa**	**42MPa**
Elongation	20.4%	33.7%
Young's modulus	51GPa	52GPa

※Alloys other than the above are also available.

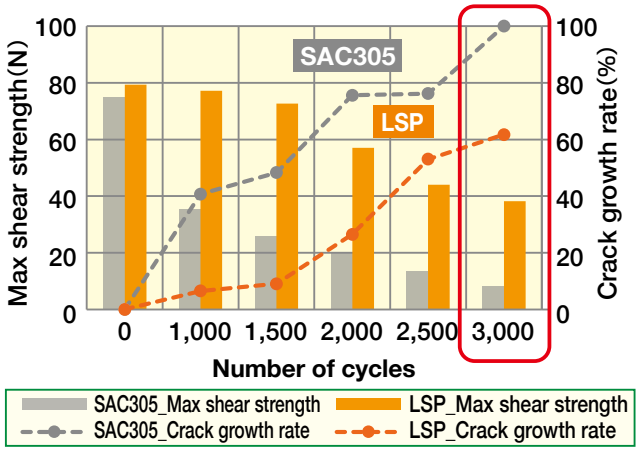
Alloy strength durability at 150℃



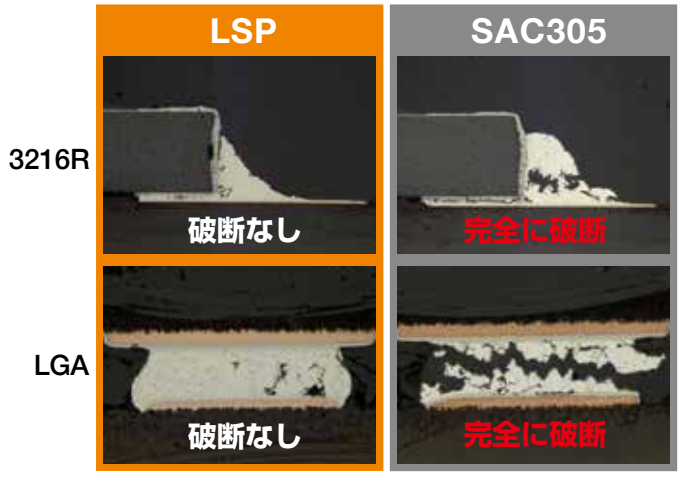
Joint Reliability Thermal fatigue characteristics (-40⇔+150℃ × 3,000 Cycle)

- Controls the progress of crack, and maintains high strength after 3,000 cycles
- Effective for solder joints of electronics parts (LGA.QFN) where stress is applied

Crack growth rate and max shear strength

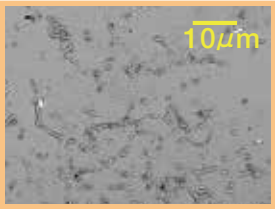
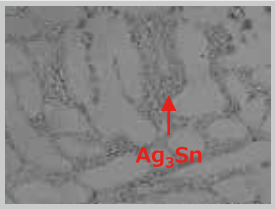
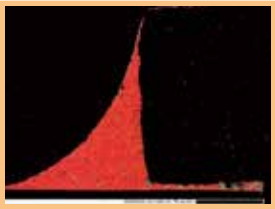
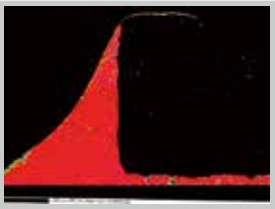
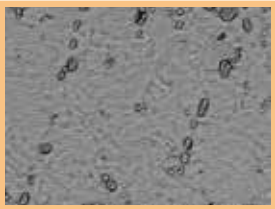
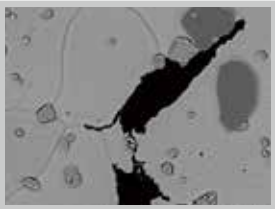
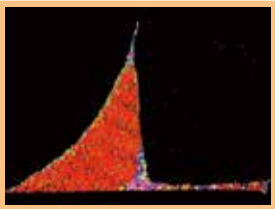
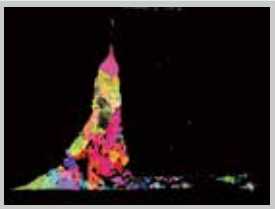


Joint cross section(3,000 cycle)



Check cross section

- For LSP, minimal internal structure (intermetallic compound) change
  - Maintains strength, prevents crack growth and progress
- For SAC305, coarser internal structure and crystal orientation change
  - Strength deterioration, influences crack generation and progress

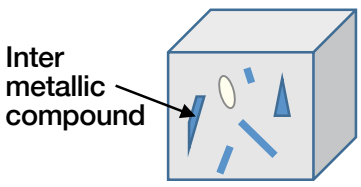
	Cross section check		EBSD Analysis (※Crystal orientation analysis)	
	LSP	SAC305	LSP	SAC305
Start				
	Dense inner structure In SAC305, Ag_3Sn forms network		Crystal orientations are in same direction	
After thermal cycle -40⇔+150℃ 3,000 cycle				
	Maintain precision	Network broken Structure coarsen	No orientation change	Change of crystal orientation

Durability improvement mechanism

- Realize high durability with 3 strengthening methods

Dispersion strengthening

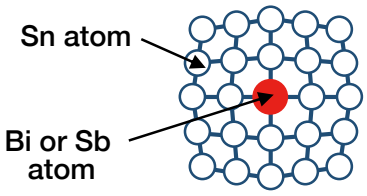
Ag (Ag_3Sn) Sb (SnSb) Cu (Cu_6Sn_5)



Hard intermetallic compound controls crack progress

Solid solution strengthening

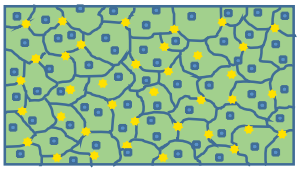
Bi Sb



Control of movement by applying strain to Sn atom

Crystal refinement

Ni Co



By becoming crystal nucleus, it prevents structure coarsening and crack growth