(CIB technology) is essential to improve quality of all LiB

〈CIB〉 can be useful for mass-production of all LiB from polymer type to vehicular loading type
To catch up rapid expansion of LiB market and improve performance of LiB, increasing of yield rate for bonding process of electrodes, complete establishment of mass-production technology which reduce production cost and bold innovation are demanded.

[CIB/Clip Ingot Bonding] 〈*Patents pending*〉

Characteristics of CIB which is only one technology in the world are as follows.

[1] This is a brand new bonding technology that 〈no bonding marks〉 like staple traces remain and surface looks like it is bonded using clips, because 〈R shaped tools〉 are used in this technology.

[2] Contamination (metal powder) is not generated because vibration of 〈beautiful sine wave〉 which isn't disturbed due to load fluctuation during bonding, doesn't destruct the parts.

[3] Sound energy is transmitted by 〈precise air analog cylinder〉. There is 〈no delay ±0〉 in bonding reaction at physical atomic level.

[4] Because there is 〈no wear〉 of R shaped tools and condition of tools is not changed, stable bonding can be obtained.

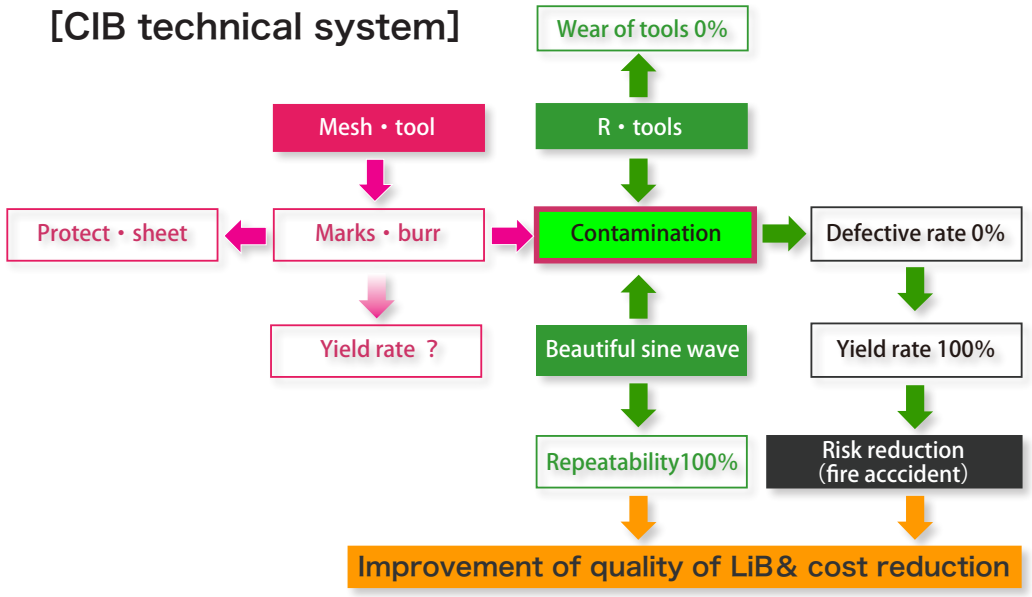
[5] 〈Protect sheets are not needed〉 because destruction force is not generated during bonding.

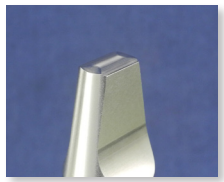
[6] All bonding process is controlled by software built in system and 〈repeatability and 100% yield rate〉 make bonding perfect.

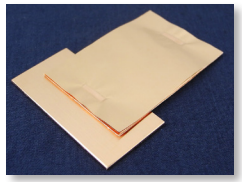
[7] 〈By digitalization of whole system, IoT〉 assists from control to monitoring of bonding conditions which are set.

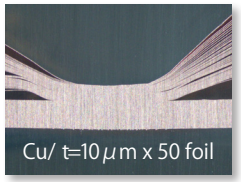
We recommend introduction of **[SoundBonding]** technology to construct ideal mass-production line.

[CIB technical system]

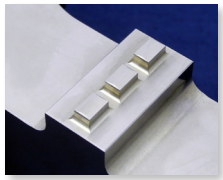


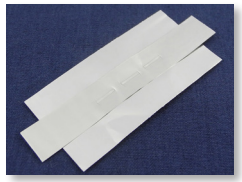

Tip of a R tool for **CIB**

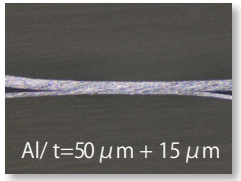

Bonding of Copper multi-foil and Copper plate



Cross section


R solid horn for **CIB**


Bonding of Aluminum foil and Aluminum tab



Cross section

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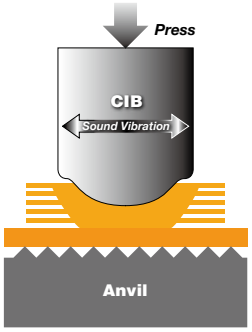
technical information

〈Relationship between frequency and tip of shape about contamination of metal foil bonding〉

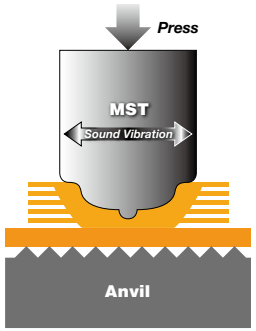
<Clip Ingot Bonding>

Problems of 〈contamination〉 which is generated during multi-layers bonding of electrodes [Copper foil] or [Aluminum foil] for large scale Lithium ion batteries equipped in vehicles can be solved by sound bonding technology. [Beautiful oscillatory wave form] and [frequency] , both of which are repeated by SoundPower, selection of [shape of tools] and precise machinery which is operated in the order of microns and control software, prevent 〈contamination〉.

【Bonding that contamination is difficult to occur】

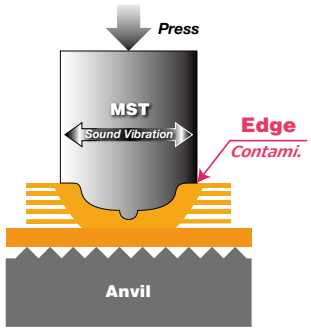


[CIB bonding - fig.1]

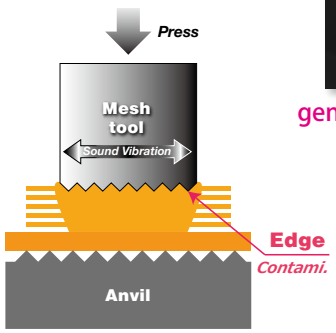


[MST bonding - fig.2]

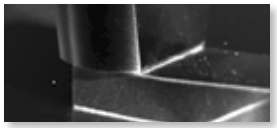
【Bonding that contamination is easy to occur】



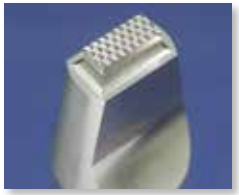
[MST bonding - fig.3]



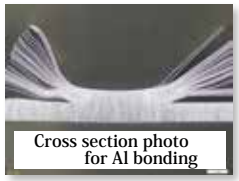
[Mesh bonding - fig.4]



generation of contamination



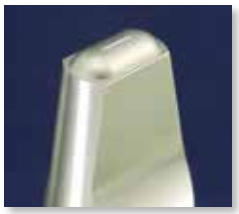
[Mesh] shaped tool



[Al foil t=20 μm x 40 layers]
without protective sheets

[Cu foil t=8 μm x 50 layers]
without protective sheets

[CIB] tool



[MST] tool
(Multi-Step Tool)

【Tendency of generation of contamination and measures against it】

(1) [CIB] or [MST] tools whose edge is not angular should be used. [Mesh] shaped tools cannot be used.
(2) To satisfy bonding strength with [CIB] or [MST] tools, [15kHz] bonding machine is better than [20kHz].
(3) Even if [CIB] or [MST] tools are used, it is impossible to bond once edge portion of tools which is angular touches metal foil during bonding due to generation of contamination. This can be prevented by <avoiding touching tools> or shape of the touching parts should be changed to <R shape>. [MST bonding - fig.3]
(4) The more layers of metal foils increase, the more energy is concentrated. **[MST] tools are better than the others.**
(5) Protective sheets cannot be used. They disturb energy concentration.

【Added value by using CIB or MST or R shaped tools】

〈1〉 By using tools whose tip is R shaped, <damages to parts such as cracks don' t occur>.
〈2〉 By using tools whose tip is R shaped, wear resistance of tools can be obtained and tools can be used for long time. This leads cost reduction.
〈3〉 Long life of tools (there in no change in shape) <leads stable bonding at mass production>.
〈4〉 Stable bonding <improves quality of products> at mass production. 〔*CIB & MST Patents pending*〕

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