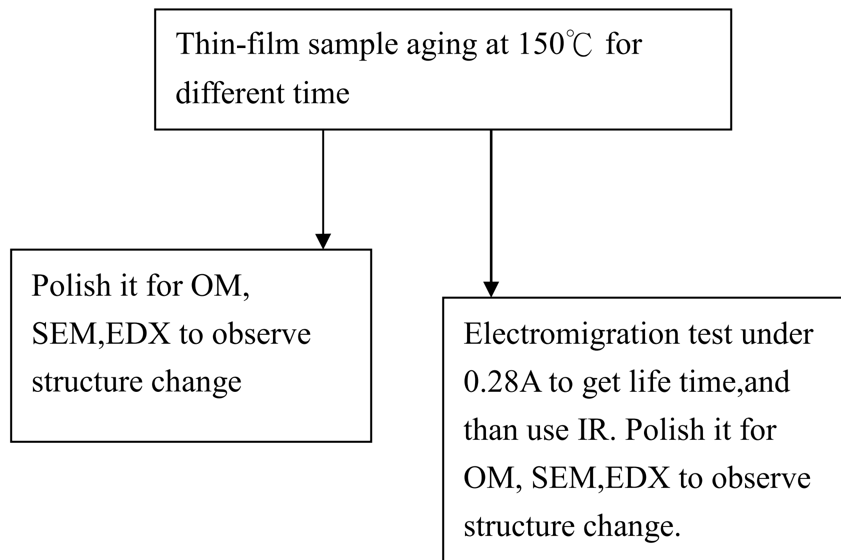
(a)



(b)

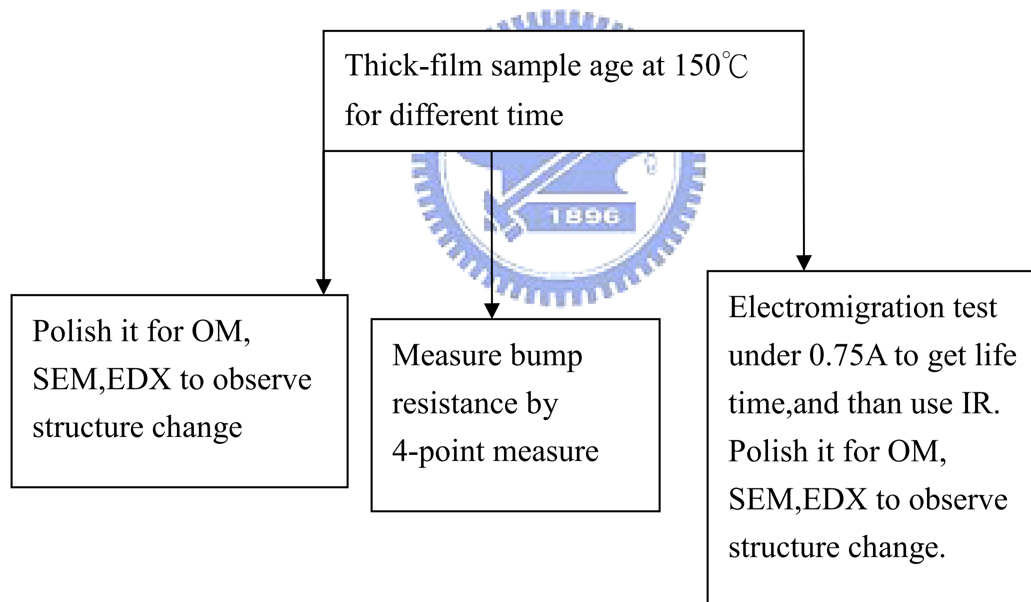


Fig.3.1 A flow sheet of our experiment (a) thin-film bump (b) thick-film bump

85 μm
Si
polyimide
Al
Ti: 0.1 μm
Cr/Cu: 0.3 μm
Cu: 0.7 μm
130 μm
Sn63Pb37
Au: 0.025 μm
Ni: 5 μm
Cu: 20 μm
Substrate
140 μm

Fig. 3.2 Thin-film sample (a) schematic diagram of bump UBM (b) SEI image

Silicon
SnSb
e⁻
Bump 2
Bump 1
Ni:5μm
Board
Cu:20 μm

Fig. 3.3 Schematic diagram of electromigration test sample

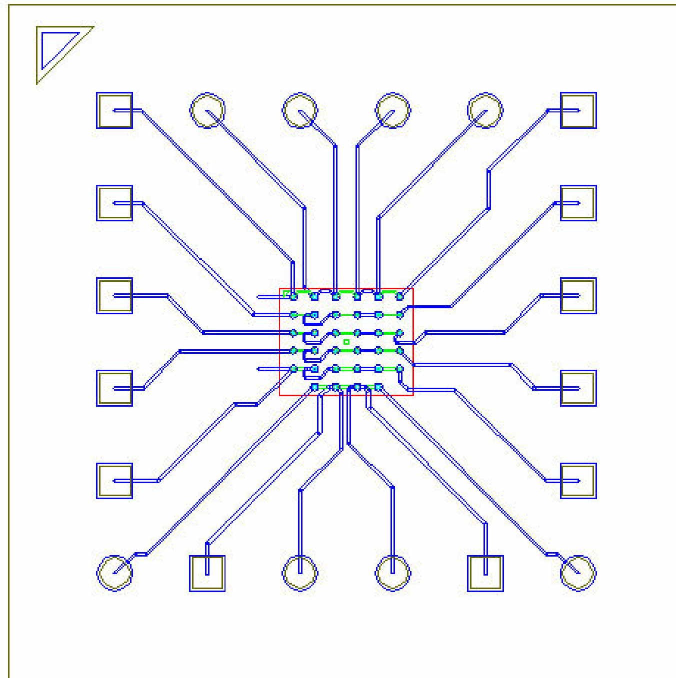


Fig. 3.4 Thick-film sample chip and FR-4 board sketch map

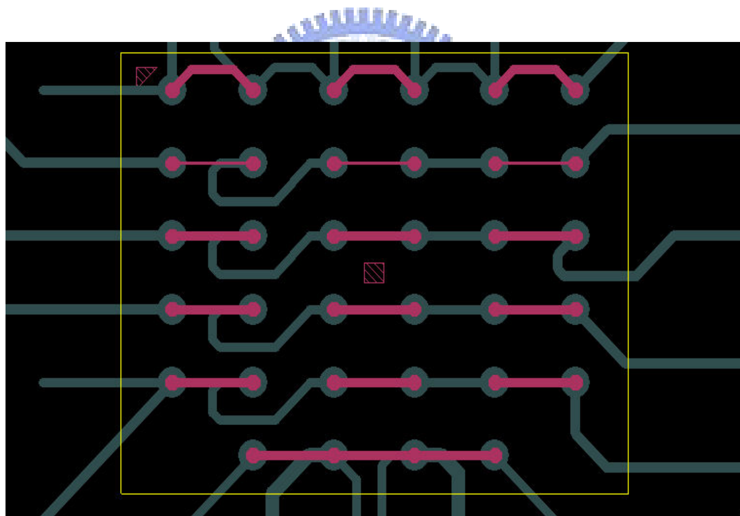


Fig. 3.5 Chip side Al line and bump connect sketch map

(a)

(b)

(c)

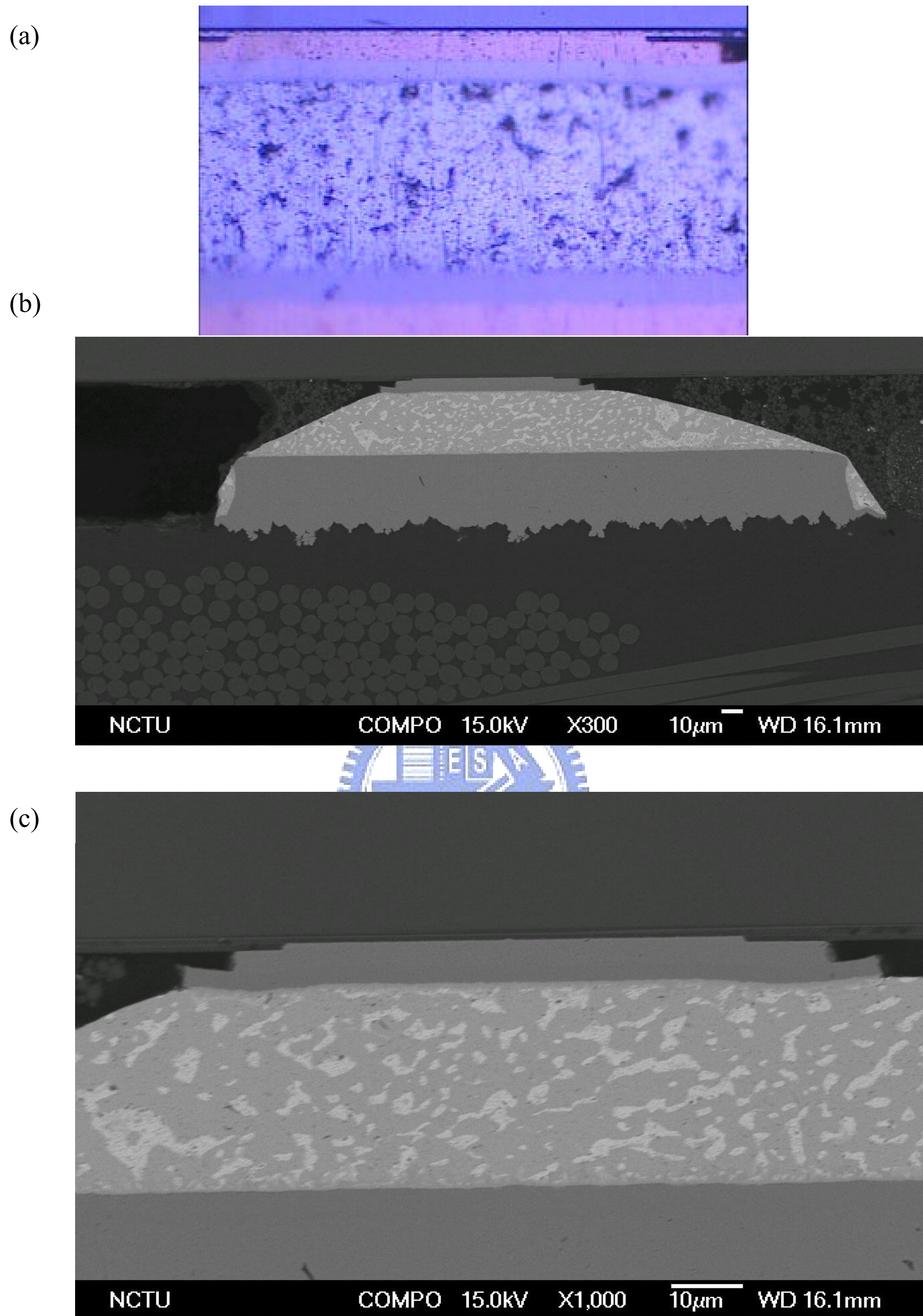


Fig. 3.6 The bump which isn't aging (a) OM image (b) BEI X 300times (c) BEI X 1000times

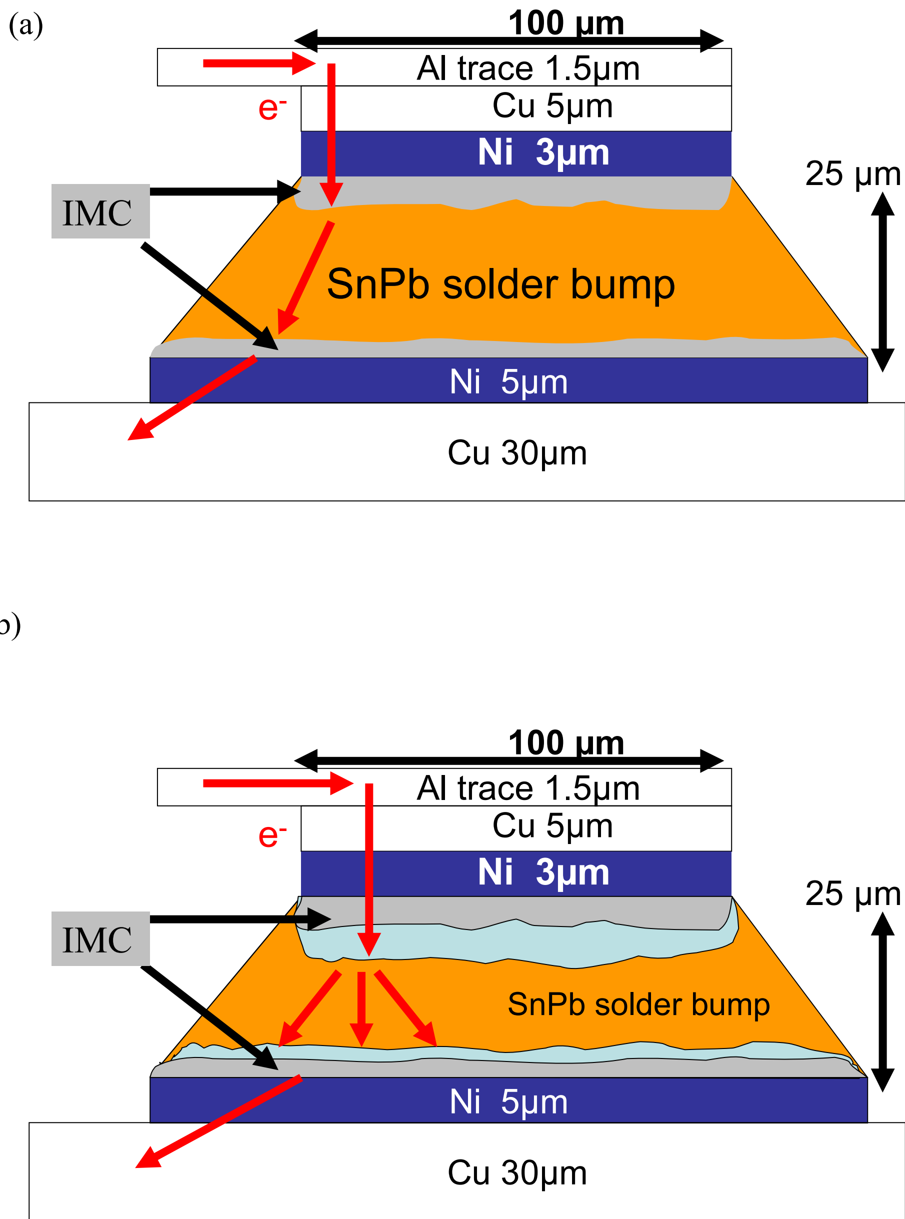


Fig. 3.7 To assume that IMC can reduce current crowding effect, schematic diagram of electromigration test sample in thick-film bump (a) no aging sample (b) aging have thicker IMC

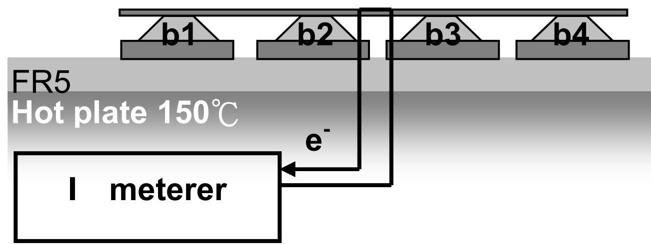
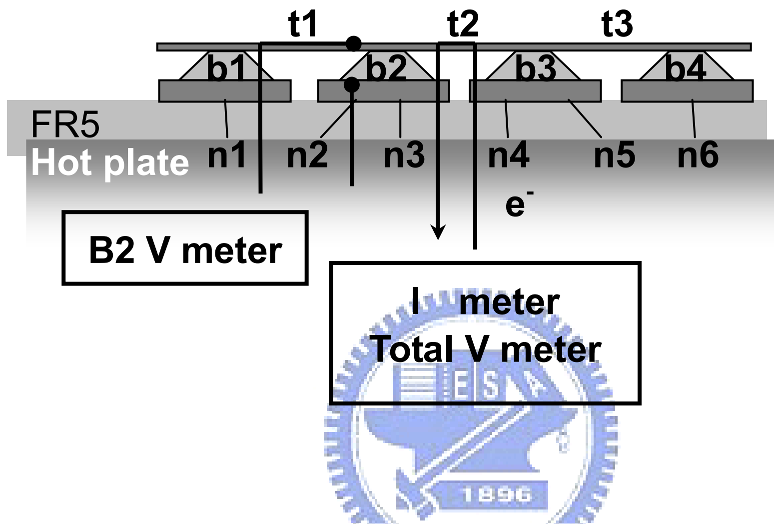


Fig. 3.8 Schematic diagram of electromigration test sample in thick-film bump

(a)



(b)

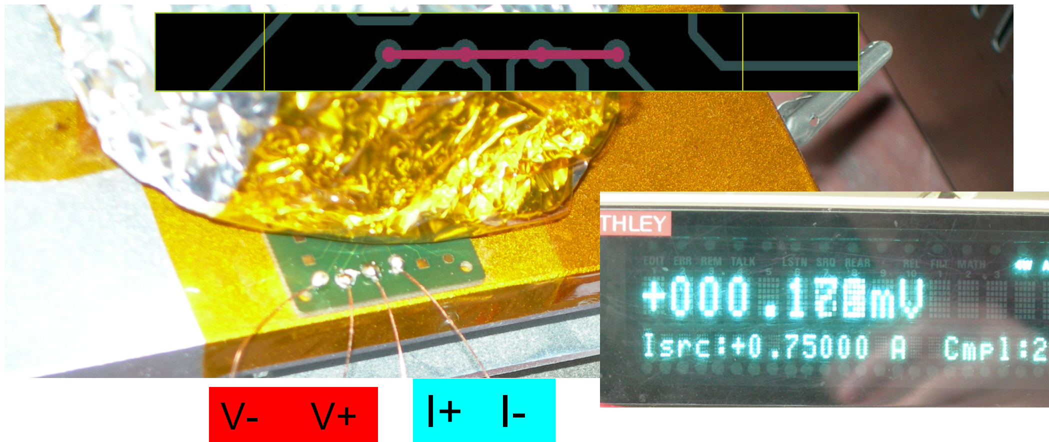


Fig. 3.9 Four-point measure in thick-film bump(a) schematic diagram (b) photograph image