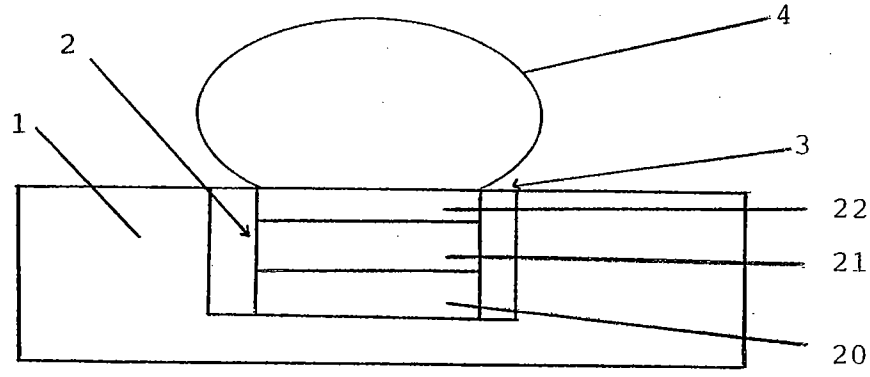


Fig. 1

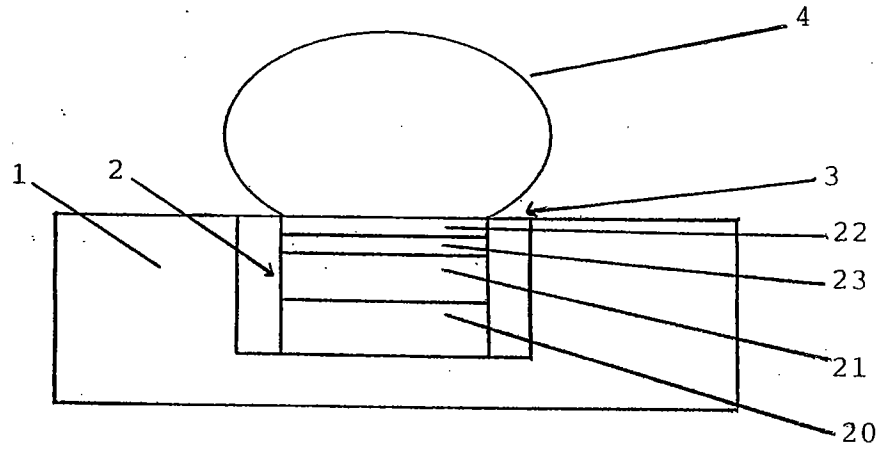


Fig. 2

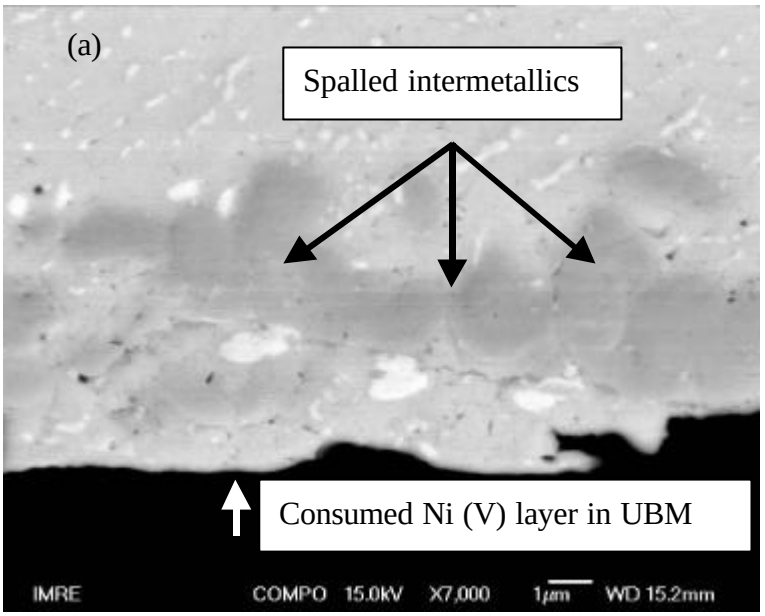

(a)
Spalled intermetallics
Consumed Ni (V) layer in UBM
IMRE
COMPO 15.0kV X7,000 1μm WD 15.2mm

Fig. 3

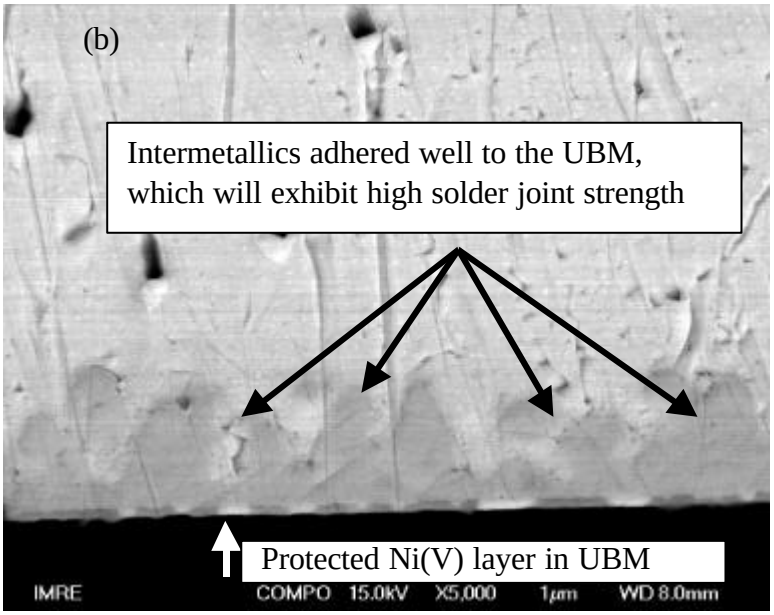

(b)
Intermetallics adhered well to the UBM,
which will exhibit high solder joint strength
Protected Ni(V) layer in UBM
IMRE
COMPO 15.0kV X5,000 1μm WD 8.0mm

Fig. 4

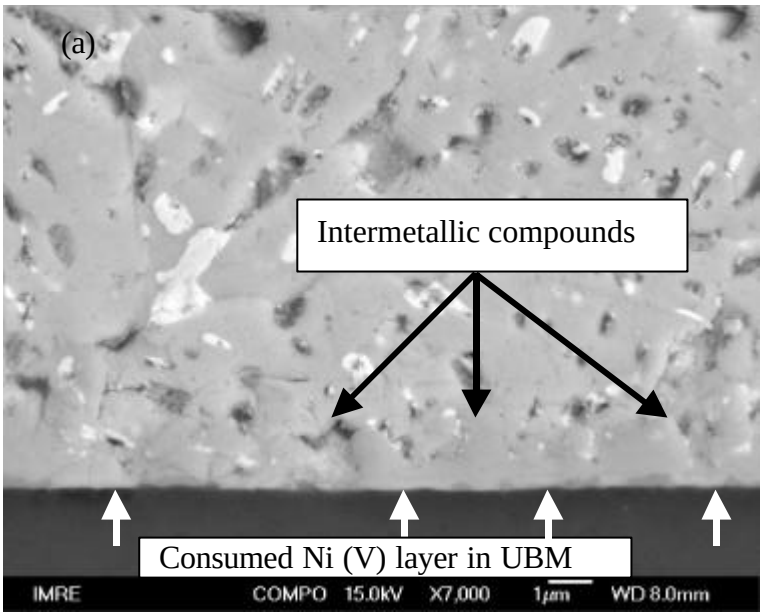

(a)
Intermetallic compounds
Consumed Ni (V) layer in UBM
IMRE
COMPO 15.0kV X7,000 1μm WD 8.0mm

Fig. 5

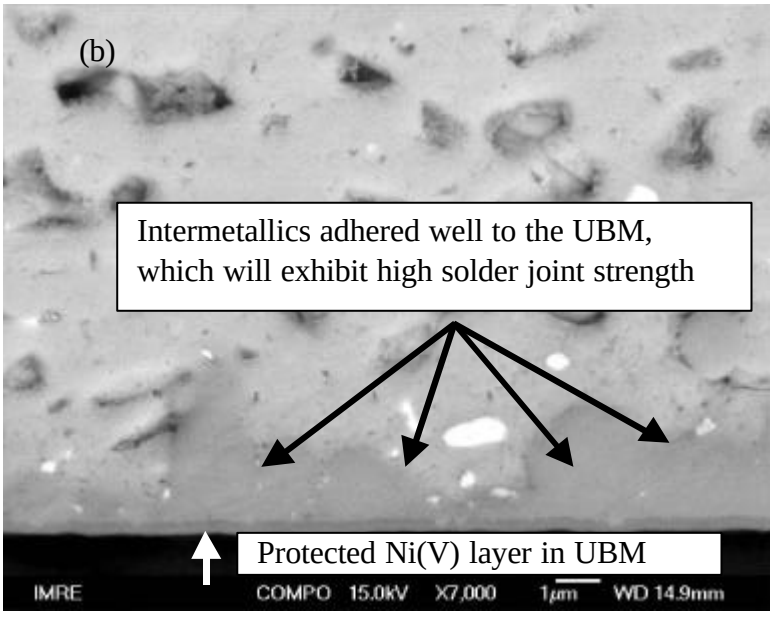

(b)
Intermetallics adhered well to the UBM,
which will exhibit high solder joint strength
Protected Ni(V) layer in UBM
IMRE
COMPO 15.0kV X7,000 1μm WD 14.9mm

Fig. 6

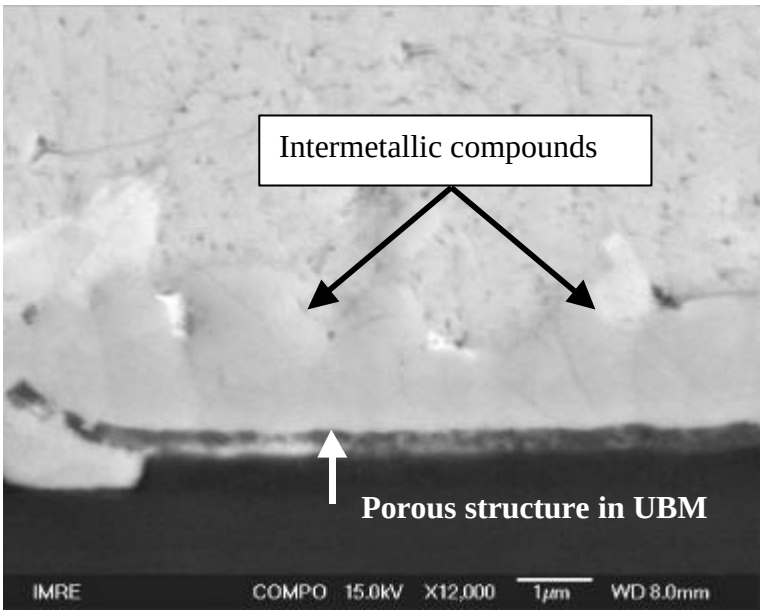

Intermetallic compounds
Porous structure in UBM
IMRE
COMPO 15.0kV X12,000 1μm WD 8.0mm

Fig. 7a

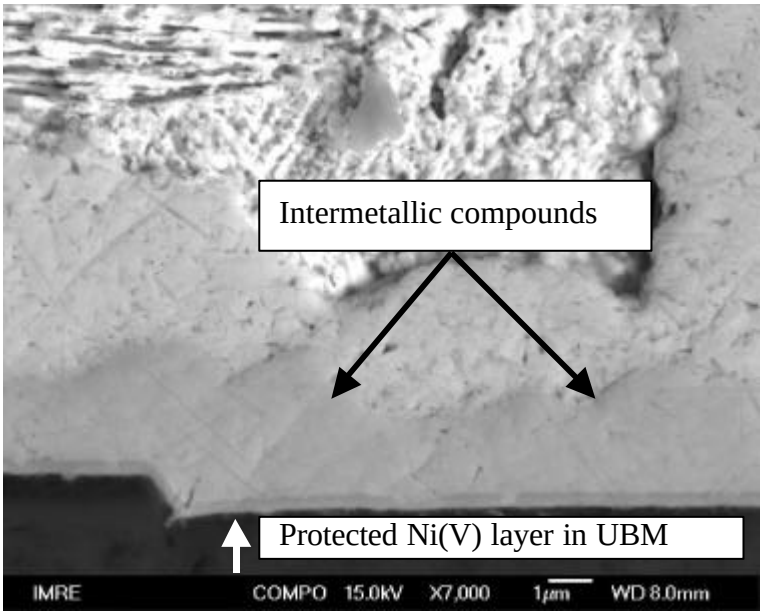

Intermetallic compounds
Protected Ni(V) layer in UBM
IMRE
COMPO 15.0kV X7,000 1μm WD 8.0mm

Fig. 7b

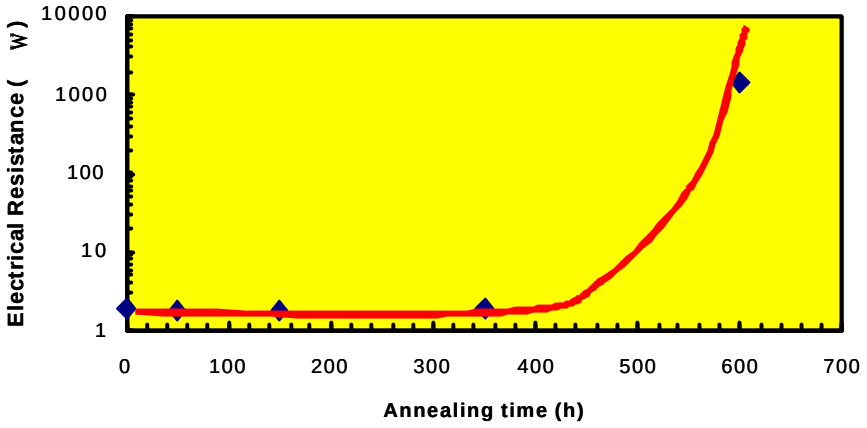

Electrical Resistance (W)
10000
1000
100
10
1
0
100
200
300
400
500
600
700
Annealing time (h)

Fig. 7c