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Tables:

Table I EDX Analysis of Co nanoparticle added sample:

| Location | Percentage of Cobalt (%) | Element Symbol | Atomic Concentration (%) | Weight Concentration (%) |
|-----------------------|--------------------------|----------------|--------------------------|--------------------------|
| Solder Matrix | 0.5 | Bi | 62.27 | 74.57 |
| | | Sn | 37.02 | 25.19 |
| | | Co | 0.71 | 0.24 |
| | 1 | Bi | 51.9 | 62.56 |
| | | Sn | 46.23 | 36.48 |
| | | Co | 1.87 | 0.96 |
| | 2 | Bi | 36.15 | 50.69 |
| | | Sn | 59.96 | 47.77 |
| | | Co | 3.89 | 1.54 |
| Interfacial IMC Layer | 0.5 | Cu | 56.115 | 68.31 |
| | | Sn | 43.615 | 30.93 |
| | | Co | 0.27 | 0.76 |
| | 1 | Cu | 56.25 | 67.57 |
| | | Sn | 43.14 | 30.82 |
| | | Co | 0.61 | 1.61 |
| | 2 | Cu | 55.9 | 66.49 |
| | | Sn | 43.05 | 30.08 |
| | | Co | 1.05 | 3.43 |

Table II Average IMC Thickness after different thermal aging temperature and different reaction time:

| Temperature (°C) | Percentage of Cobalt (%) | Reaction Time (minutes) | Average Thickness (µm) |
|------------------|--------------------------|-------------------------|------------------------|
| 0 | 0 | 7560 | 1.37 |
| | | 30240 | 1.37 |
| | 0.5 | 7560 | 1.25 |
| | | 30240 | 1.25 |
| 70 | 0 | 7560 | 0.6 |
| | | 30240 | 1.82 |
| | 0.5 | 7560 | 0.35 |
| | | 30240 | 1.69 |
| 85 | 0 | 7560 | 0.62 |
| | | 30240 | 2.45 |
| | 0.5 | 7560 | 0.55 |
| | | 30240 | 1.77 |
| 100 | 0 | 7560 | 0.8 |
| | | 30240 | 3.2 |
| | 0.5 | 7560 | 0.58 |
| | | 30240 | 2.37 |
| 160 | 0 | 5 | 0.75 |
| | | 30 | 2.14 |
| | 0.5 | 5 | 0.66 |
| | | 30 | 1.34 |
| 180 | 0 | 5 | 0.91 |
| | | 30 | 2.29 |
| | 0.5 | 5 | 0.82 |
| | | 30 | 1.43 |
| 200 | 0 | 5 | 1.29 |
| | | 30 | 3.24 |
| | 0.5 | 5 | 1.07 |
| | | 30 | 1.87 |