

1 **Novel Pd-Catalyzed Electroless Au Deposition Method using a Sulfite Solution**

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1 The composition of Ni bath, Pd bath and gold bath are listed in Table SI, SII and SIII.

**Table SI.** Composition and operating conditions for Ni-P bath.

Bath constituents	
NiSO <sub>4</sub> •6H <sub>2</sub> O	20 g/L
NaH <sub>2</sub> PO <sub>2</sub> •H <sub>2</sub> O	25 g/L
DL-Lactic acid	24 g/L
Propionic acid	4 g/L
CH <sub>3</sub> COONa	10 g/L
Propargyl alcohol propoxylate (PAP)	10 ppm
Aqueous ammonia (28%)	25 ml
pH(H <sub>2</sub> SO <sub>4</sub> , NaOH)	5.0
Temperature	80°C

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**Table SII.** Composition and operating conditions for electroless Pd-P bath.

Bath constituents	
PdSO <sub>4</sub>	10 mM
Ethylenediamine	0.2 M
Reductant	0.1 M
Na <sub>2</sub> HPO <sub>4</sub>	0.2 M
stabilizer	0.01 mM
pH(H <sub>2</sub> SO <sub>4</sub> , NaOH)	6.5
Temperature	65°C

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**Table SIII.** Composition and operating conditions for gold bath.

Bath constituents	
Na <sub>3</sub> Au(SO <sub>3</sub> ) <sub>2</sub>	5 mM
Na <sub>2</sub> SO <sub>3</sub>	0.3 M
Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> •5H <sub>2</sub> O	5 mM
Na <sub>2</sub> HPO <sub>4</sub>	0.2 M
EDTA-2Na	0.025 M
pH(H <sub>2</sub> SO <sub>4</sub> , NaOH)	6.5
Temperature	65°C

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1 The ENIG process and the added Pd interlayer process are shown in Table SIV

**Table SIV.** Specifications of the process of Pre-treatment, Electroless Ni-P, Electroless Pd-P and Electroless gold

Process	Electrodeposited layer
Pre-treatment	degreasing and pickling palladium activation
Electroless Ni-P	Ni-P (7~9wt.% P) Thickness: 4 $\mu\text{m}$ Time: 20 min
Electroless Pd-P	Pd-P (2~3wt.% P) Thickness: 0.05 $\mu\text{m}$ Time: 5 min
Electroless gold	Au (100wt.%) Operating temperature: 65°C pH: 6.5

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