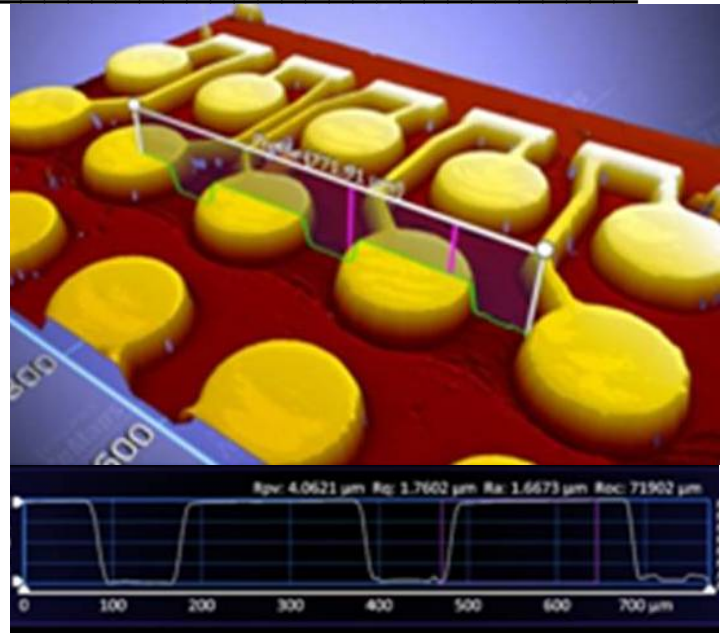


## Better Metallization Technology Revealed

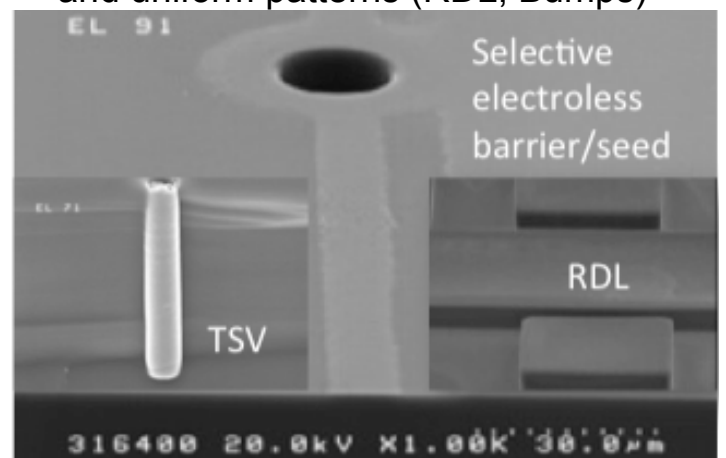
**NANO3D provides revolutionary metallization technology and proprietary materials to enable novel 3D chipset architectures for future generations of smart phones and advanced IoT devices.**

### Highlights:

- NANO3D's management team has unparalleled domain expertise having lead metallization technology development and deployment at the largest semiconductor companies with strong experience building successful start up companies.
- Superior, critical and disruptive eLOCOS™ platform technology in a directly addressable market of \$11.7B by Y2018 including mobile, touchscreen, clean energy and biomedical applications.
- Substantial IP portfolio (patents & trade secret-protected).
- Partnerships with leading plating equipment suppliers and R&D consortiums for process materials qualification. Toll manufacturing of NANO3D process chemicals at established chemical company.
- Advanced thin film processing and analytical capabilities to expedite customers' metallization process development, reduce ramp time to production, and accelerate fabs' process development ROI.



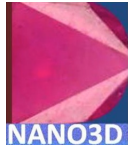
Controlled expansion alloy plating of flat and uniform patterns (RDL, Bumps)



Selective electroless barrier/seed and copper electroplating (B/S, TSV, RDL)



High speed Cu electroplating of flat and uniform patterns (Bumps, Damascene)



## Better Metallization Technology Revealed

### Product Categories

#### Defect-free electrofill of vias and trenches (3D TSuV and damascene)

- High purity copper electrolyte
- Suppression-based plating additives
- Bath metrology standards and reagents

#### High speed electroplating of bumps and redistribution layers (RDL)

- High purity & concentration copper electrolyte
- Suppression-based plating additives
- Bath metrology standards and reagents

#### Controlled expansion alloy electroplating

- High purity electrolyte
- Plating additives (stress reducer, stabilizer and wetting agent)
- Bath metrology standards and reagents

#### Conformal and selective electroless Ni (Co) & Cu plating

- High purity electrolytes
- Plating additives (stabilizers and wetting agents)
- Bath metrology standards and reagents

#### Controlled expansion & pinhole-free foils and films

- Ultrathin (5 – 20  $\mu\text{m}$ )
- Low stress (<50 MPa)
- Controlled CTE (<  $0.5 \times 10^{-6}, \text{K}^{-1}$ )

### Analytical & Plating Services

#### Chemical analysis services in multi-component solutions

- UV-VIS (Cu, Ni, Co, Fe, W, Pd)
- Titration (acid-base, redox, precipitation, complexometric)
- FTIR, GC, IC, CVS of plating additives

#### Thin film materials characterization services

- Thermal testing (heat capacity, thermal conductivity, thermal expansion)
- Mechanical testing (internal stress, Young modulus, yield strength, tensile strength, ductility)
- Surface morphology (optical profilometer, AFM)

#### Plating micro-fabrication services

- Through-resist electroplating and photo-selective electroless deposition (Ni, Co, Fe, Cu, Sn, Au, Ag, Pd and alloys) on various substrates
- Metallization of flexible and stretchable substrates (glass and polymers)

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