

# Electroless Au Plating on Pt

## Room temperature operable 0.7nm Au nanogap electrodes by electroless Au plating on Pt

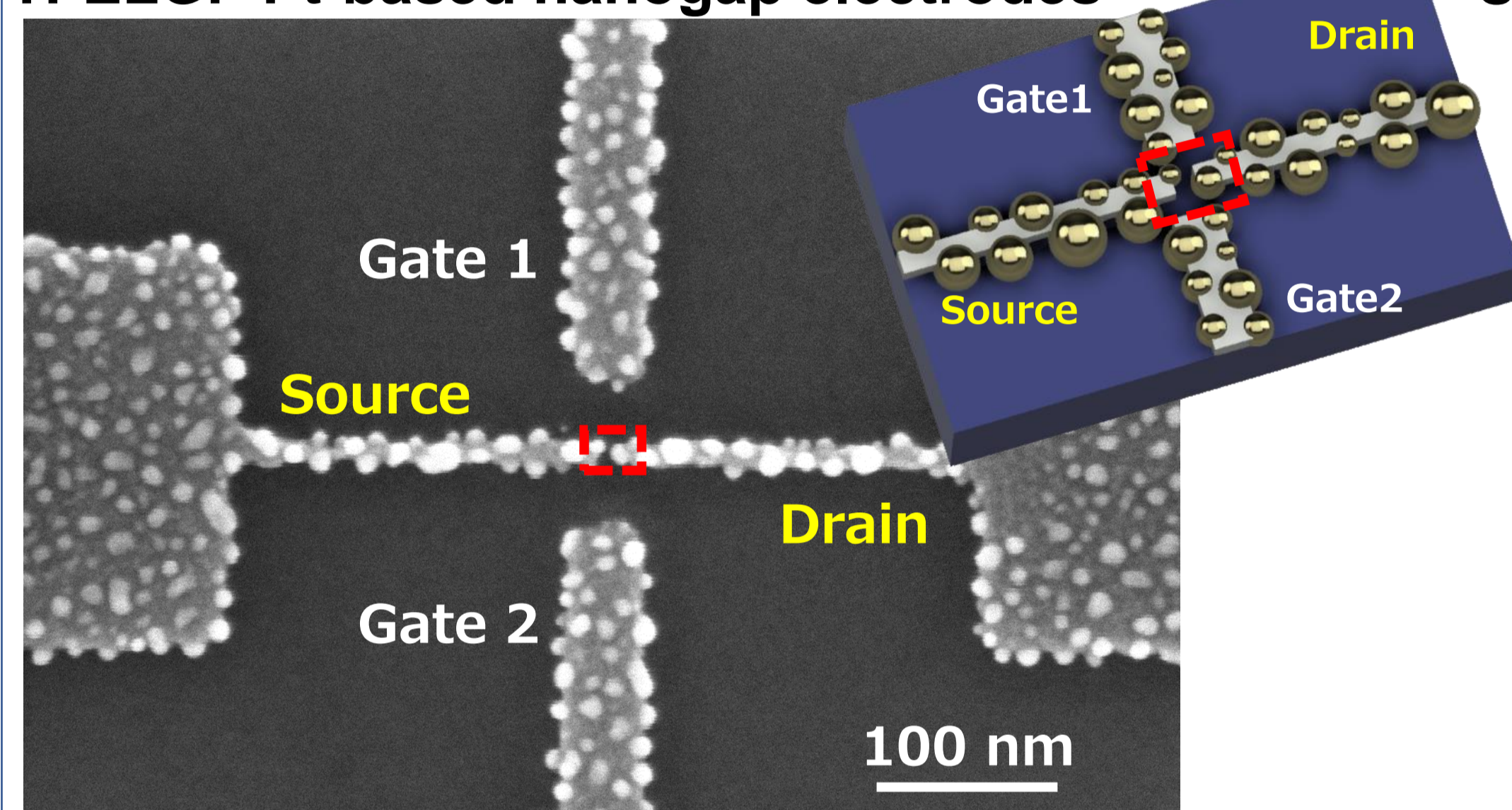
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### 1. Abstract

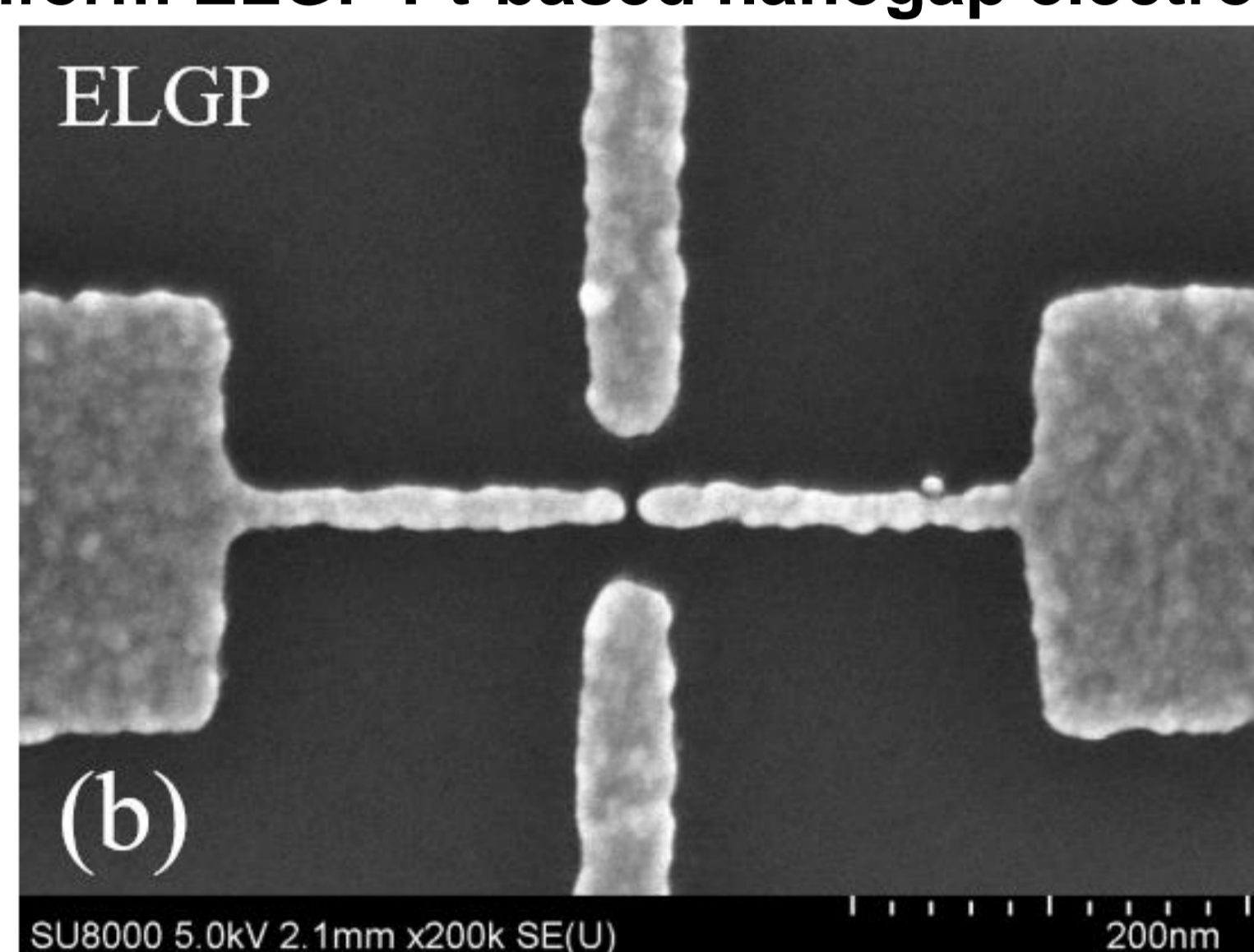
- Au has not been used in several tens of nanometers scaled devices in a room temperature for the reason that it could not maintain its shape due to its surface self-diffusion.
- Our unique Electroless Au plating (ELGP) on Pt technology overcame this problem.
- The nanogap electrodes by Hemispheric ELGP (H-ELGP) on Pt can realize:
  - Gap separation control: self-termination mechanism without short circuit
  - Robustness: thermally stable from room temperature to 573K
  - Ultra-small gap: i.e. 0.7 nm gap

### 2. Key Features, Principle of the Invention, Structure of the Material

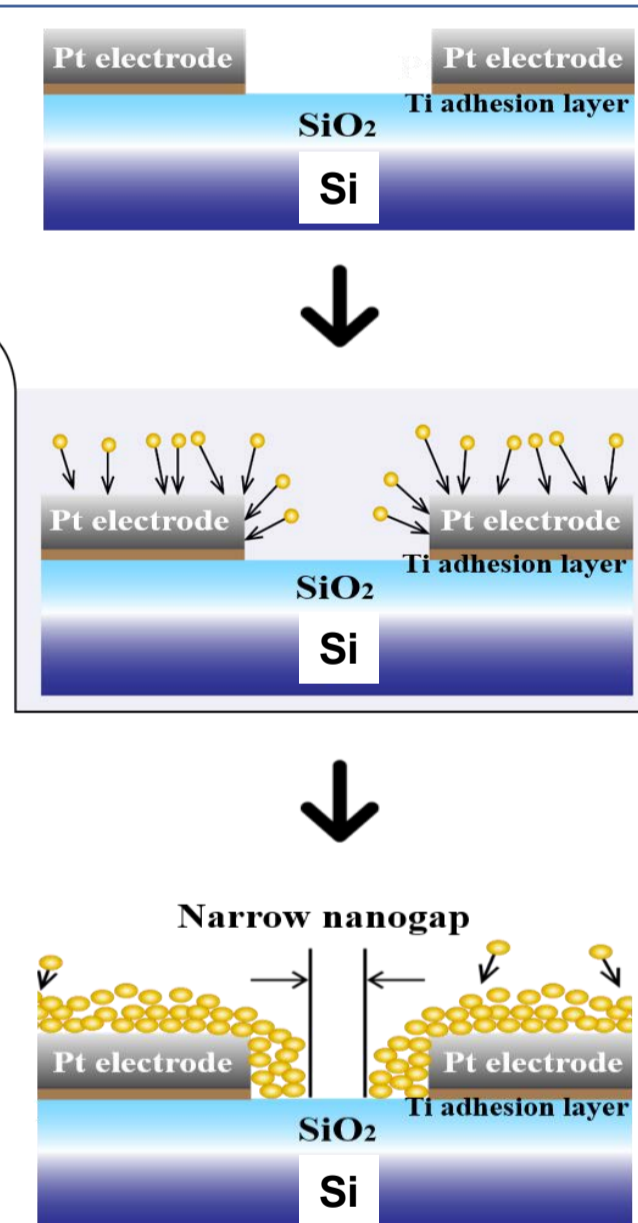
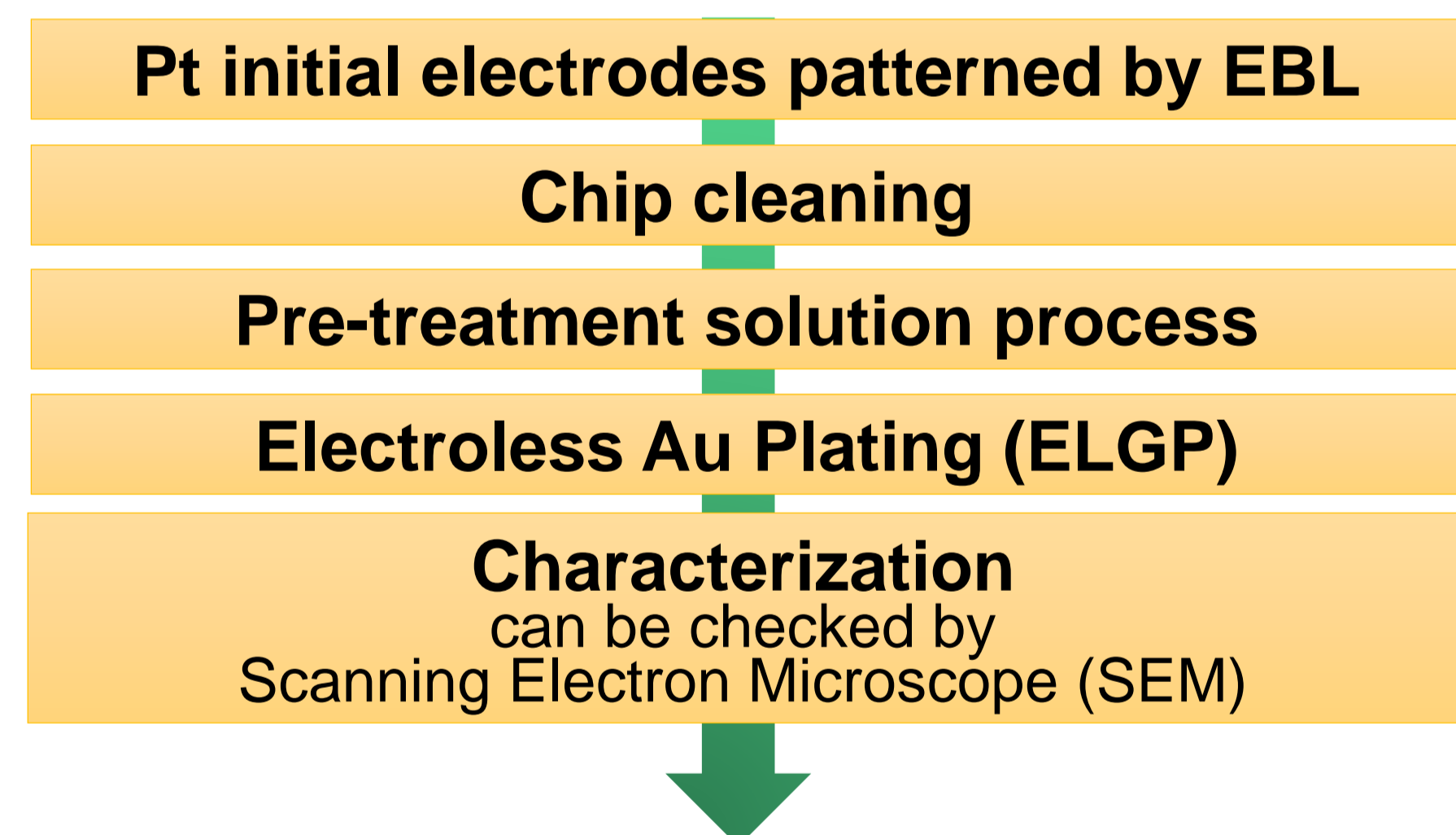
#### H-ELGP Pt-based nanogap electrodes



#### Uniform ELGP Pt-based nanogap electrodes



### 3. Fabrication Process of H-ELGP



**Advantages of Pt electrodes**

- ▶ High melting point  
 $T_m(\text{Pt})=1768^\circ\text{C}$ ,  $T_m(\text{Au})=1064^\circ\text{C}$
- ▶ Strong adhesion and durability

**Advantages of ELGP**

- ▶ Simple bottom-up process
- ▶ Mass-producibility
- ▶ Operable at room temperature
- ▶ Non-toxic materials

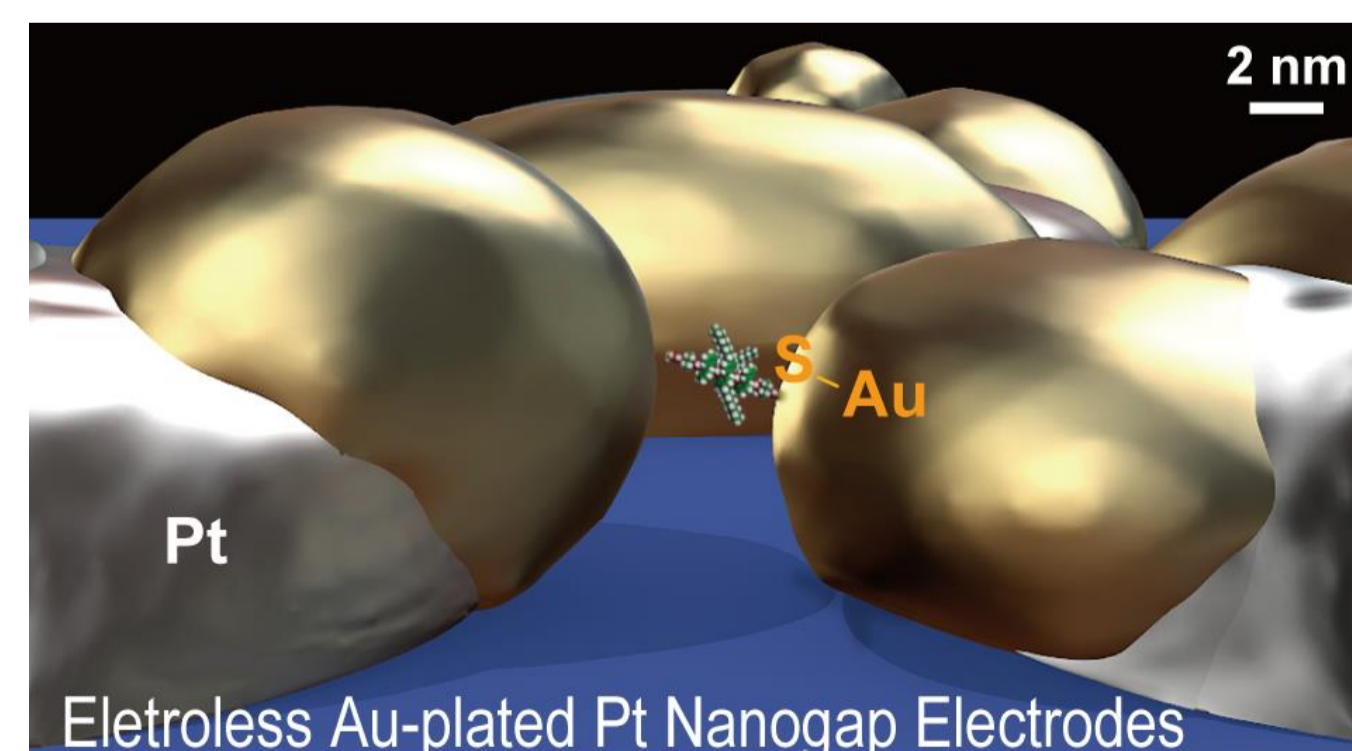
### 4. Applications

#### ELGP on Pt

- ▶ Biosensor, Power electronics, Automobile
- ▶ Advantage: Thermally stable and low contact resistance

#### H-ELGP nanogap electrodes

- ▶ Nanogap sensors, logic transistor beyond 3nm node
- ▶ Advantage: Robust nanogap, large gate capacitance



### 5. Patent Licensing Available

Patent No.: WO2012/121067 (JP, US, KR, CN)  
WO2013/129535 (JP, US, EP, CN, KR, TW)  
WO2015/033600 (JP, US, EP, CN, KR, TW)  
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