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Article / Book Information

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著者(和文)	SerdioVillarreal Victor Manuel
Author(English)	Victor SERDIO
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Thesis Outline

Nanogap electrodes are a platform for nanodevices such as single- electron transistors (SETs) and molecular devices. They allow us to harness the electrical characteristics of many nanostructures such as nanoparticles and functional molecules by interconnecting them with two terminals. I have reported the simultaneous fabrication of multiple nanogap electrodes for integration of individual nanostructures into electronic circuits by a combination of electron beam lithography (EBL) and different electroless gold plating (ELGP) techniques based on gold surface catalytic baths. Electrodes with an initial separation of approximately 22 nm were immersed into the plating solutions and a gold layer grew over the electrode's surface, narrowing the separation between them. Its growth stopped around 3 nm due to a self-termination mechanisms, different for each of the plating techniques. In the iodine based ELGP, its based in the decrease in the mass-transport of the $[\text{AuI}_2]^-$ plating ions due to the decrease in size of the nanogap and their lower availability within the solution which is inversely proportional to the plating time. Iodine ELGP main advantage relies on its high yield (>90%) of functional nanogaps (1-5 nm in separation), and small standard deviation of less than 2 nm.