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Nanojunction Sensors for the Detection of chemical and Biological Species

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Invention Description

Commercial applications of nanotechnology require reliable and cost-effective methods to mass-fabricate various nanostructured materials and devices. Atomic-scale contacts between metal electrodes have been created mechanically by breaking a fine metal wire and by separating two metal electrodes in contact. The breaking and separating are usually controlled by an apparatus involving stepping motor or piezoelectric transducer. The contacts fabricated by the mechanical methods cannot be removed from the apparatus, and they are, therefore, not suitable for most applications. A non-mechanical method that anodizes an aluminum wire locally with an atomic force microscope has been reported, but the use of the atomic force microscope makes it impossible for mass-production.

Researchers at ASU have invented a self-terminated method to fabricate atomic-scale contacts and molecular-scale gaps between metal electrodes. This method can quickly and reliably mass-produce large arrays of atomic-scale contacts and gaps for various applications, including chemical and biological sensors, magnetoresistive sensors and molecular electronic and optoelectronic devices. This invention can turn these applications into commercial products.

Potential Applications

- **Fabrication of molecular sensors for use in chemical and biological applications**
- **Capable of rapid detection of hydrogen molecules in a fuel cell or hydrogen-fueled system**
- **Construction of heavy metal ion sensors for use of early detection of trace metal contaminants on site**
- **Biosensor construction where a single molecular binding event is converted into an electrical signal. This is useful in a number of applications including, antigen detection, nucleic acid sequencing, food inspection and early warning systems for biodefense**

Benefits and Advantages

- **High sensitivity**
- **Low sample concentration detection**
- **Fast response time**
- **Low power consumption**
- **Ease of integration into other microelectronics**
- **Ability to mass manufacture**
- **Miniaturization of sensors**

Intellectual Property Status:

US patent 6737286
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