NISTTech

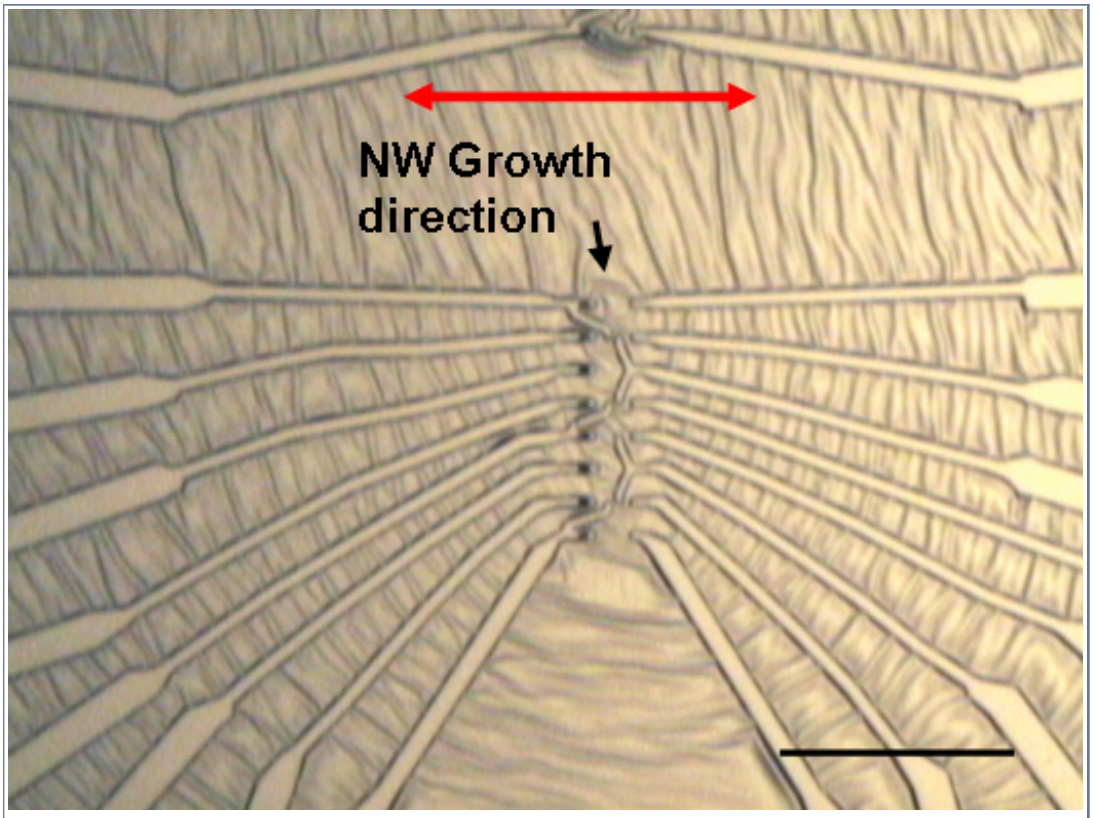
FABRICATION OF NANOWIRES AND NANODEVICES

Industrial Scale Fabrication of Nanowire-Based Devices

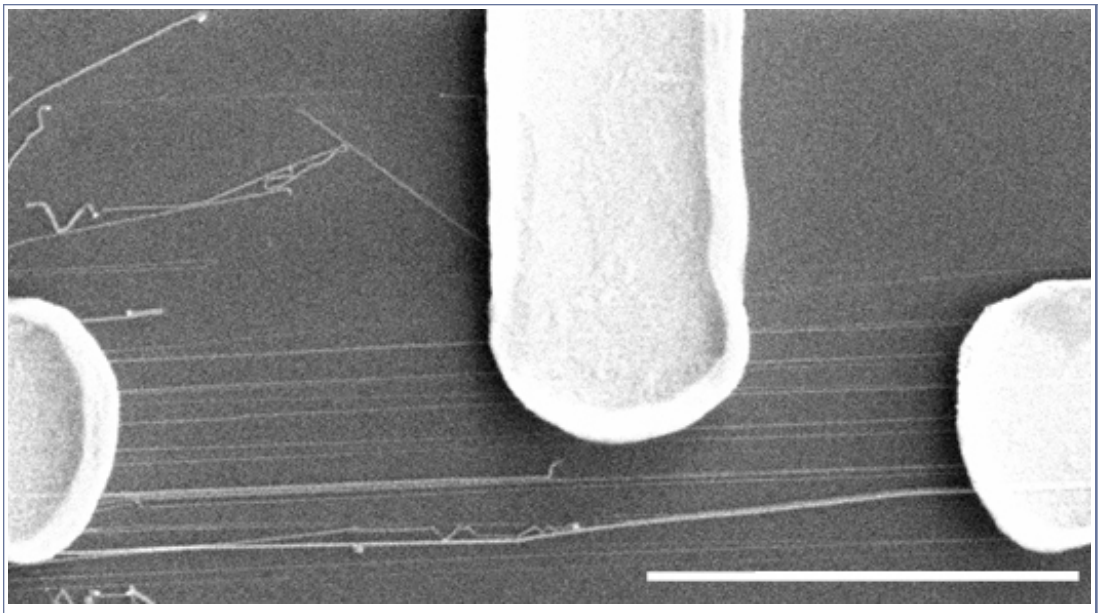
Description

Grow nanowire for semiconductor devices using this photolithography process. The nanowire is directly grown on the device substrate to which electronic components are subsequently added. The new process eliminates several fabrication steps, thereby enabling the microelectronic industries to fabricate nanodevices on an industrial scale.

Images



Metal electrodes on zinc oxide nanowires; dark central spots are the gold pads that start nanowire growth; red arrow shows direction of growth; scale bar is 50 micrometers.



Scanning electron microscope image shows electrodes connected to group of nanowires; Scale bar

is five micrometers long

Applications

- **Heterostructure semiconductor fabrication**
  Enables the construction of heterostructure semiconductors and their nanodevices.
- **Mass fabrication**
  Permits mass fabrication of nanowire-based transistors and sensors including field effect transistors, flash memory devices, nanosensors, and nanolight emitters.
- **Nanocrystals**
  Potential use in the field of nanocrystal growth as a platform for building more complex architectures.

Advantages

- **Millions of configuration possibilities**
  Using this process, millions of nanowires with known registries and orientation can be grown.
- **Cost savings**
  Fabrication via low-resolution photolithography.
- **Produces a variety of configurations**
  The number of nanowires per site can be controlled, depending upon the number of gold nanodroplets per site; individual or groups of nanowires can be grown and assembled into nanowire devices.
- **On-site precision**
  Nanowires can be grown with a sub micrometer precision directly on the substrate to be used, eliminating the need to transfer the wires to a different substrate.
- **Easy to produce**
  Scalable process reduces the number of fabrication steps and provides easy device fabrication.

Abstract

This invention allows control over the location and direction of nanowires on a large size single crystal wafer.

Inventors

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Citations

1. B. Nikoobahkt. Towards industrial scale fabrication of nanowire-based devices. Chemistry of Materials, Vol. 19, pp. 5279-5284, 2007.

Related Items

- Article: Gold Nano Anchors Put Nanowires in Their Place
- Article: NIST Demos Industrial-Grade Nanowire Device Fabrication

References

- US Patent #7,968,433 issued 06/28/2011, expires 10/8/2028; U.S. Patent Application Serial #12/247,617 app date 10-08-2008
- Docket: 08-011

Status of Availability

active patent and available for licensing

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