UNIVERSITY OF MINNESOTA
Driven to Discover℠

Ultra-smooth Patterned Metal Films for Plasmonics

Ultra-smooth Patterned Metal Films for Plasmonics and Metamaterials

Nanosized Plasmonic Devices with Patterned, Super-Smooth Surfaces

A fabrication method to obtain ultra-smooth pure metal films with a variety of nanometer sized structural features including grooves, bumps, pyramids, ridges, and holes for sensor and plasmonic applications has been developed. It is a simple, high throughput process that is highly reproducible and produces fewer surface imperfections than other processes. The devices produced using this process can be used in applications such as plasmonic devices, biosensors, solar cells, metamaterials and superfast computer chips.

The process starts by etching patterns onto a very smooth silicon wafer, and coating the wafer with a thin layer of silver, gold or copper. Once the metals had set, the film is peeled off to reveal patterned metal surfaces that were just as smooth as the silicon wafer templates.

Metamaterials Have Unique Magnetic, Optical and Electromagnetic Properties

The developed process allows for the fabrication of patterned super-smooth metal films with nanometer sized structural features including grooves, bumps, pyramids, ridges, and holes. These features or combinations of these features can lead to the creation of plasmonic devices, superfast computer chips and metamaterials with unique magnetic, optical, and electromagnetic properties. Measurements on created surfaces have shown surface plasmon propagation lengths close to theoretical values. In addition, structures with excellent performance in sensing and optical applications have been developed.

BENEFITS AND FEATURES OF ULTRA-SMOOTH PATTERNED METAL FILMS FOR PLASMONNICS:

- Method is simple and has high throughput (low cost)
- Results are highly reproducible
- Surface roughness is
- Device mold is reusable
- High surface homogeneity. Implanted ions are avoided.

Technology ID

z09085

Category

Engineering & Physical Sciences/Nanotechnology
Engineering & Physical Sciences/Photonics
Life Sciences/Research Tools

Learn more