

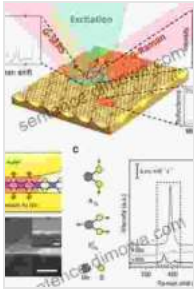
2D Materials for Surface Plasmon Resonance Based Sensors: Emerging Materials and Applications

Surface plasmon resonance (SPR) is a powerful optical technique for sensing and imaging at the nanoscale. It relies on the interaction of light with metal nanoparticles, which can support collective oscillations of electrons known as surface plasmons. These oscillations can be excited by light at specific wavelengths, and their resonance frequency is sensitive to changes in the refractive index of the surrounding environment. This makes SPR a highly sensitive tool for detecting and characterizing materials, molecules, and biological samples.

2D materials are a new class of materials that have attracted considerable interest in recent years due to their unique properties. These materials are only a few atoms thick, and they exhibit a wide range of electronic, optical, and mechanical properties. 2D materials have been shown to enhance the performance of SPR sensors, making them even more sensitive and versatile.

In this article, we will discuss the use of 2D materials for SPR-based sensors. We will first introduce the basic principles of SPR and then discuss how 2D materials can be used to improve the performance of SPR sensors. We will also provide some examples of applications of 2D material-based SPR sensors.

2D Materials for Surface Plasmon Resonance-based Sensors (Emerging Materials and Technologies)



by Philip E. B. Jourdain

★★★★★ 5 out of 5

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Surface plasmon resonance (SPR) is a phenomenon that occurs when light interacts with a metal surface. When light strikes a metal surface, it can excite collective oscillations of electrons known as surface plasmons. These oscillations are confined to the surface of the metal, and they can propagate along the surface like waves.

The resonance frequency of surface plasmons is determined by the wavelength of the incident light, the refractive index of the metal, and the refractive index of the surrounding environment. When the resonance frequency is matched, the surface plasmons are strongly excited, and this results in a sharp decrease in the intensity of the reflected light.

The sensitivity of SPR sensors to changes in the refractive index of the surrounding environment makes them ideal for detecting and characterizing materials, molecules, and biological samples. SPR sensors have been used in a wide range of applications, including biosensing, chemical sensing, and environmental monitoring.

2D materials are a new class of materials that have attracted considerable interest in recent years due to their unique properties. These materials are

only a few atoms thick, and they exhibit a wide range of electronic, optical, and mechanical properties.

Some of the most common 2D materials include graphene, molybdenum disulfide (MoS₂), tungsten disulfide (WS₂), and hexagonal boron nitride (h-BN). These materials have been shown to have a number of advantages over traditional materials, including high strength, flexibility, and electrical conductivity.

2D materials can be used to improve the performance of SPR sensors in a number of ways. First, 2D materials can be used to increase the sensitivity of SPR sensors. This is because 2D materials have a high refractive index, which makes them more sensitive to changes in the refractive index of the surrounding environment.

Second, 2D materials can be used to reduce the size of SPR sensors. This is because 2D materials are very thin, which allows them to be used in smaller devices.

Third, 2D materials can be used to improve the stability of SPR sensors. This is because 2D materials are very strong and durable, which makes them less susceptible to damage.

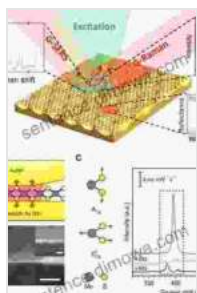
2D material-based SPR sensors have a wide range of potential applications, including:

- **Biosensing:** 2D material-based SPR sensors can be used to detect and characterize biomolecules, such as DNA, proteins, and cells. This makes them ideal for applications in medical diagnostics, drug discovery, and food safety.

- **Chemical sensing:** 2D material-based SPR sensors can be used to detect and characterize chemical compounds, such as pollutants, toxins, and explosives. This makes them ideal for applications in environmental monitoring, homeland security, and industrial process control.
- **Optical imaging:** 2D material-based SPR sensors can be used to create high-resolution images of surfaces. This makes them ideal for applications in microscopy, lithography, and optical inspection.

2D materials are a promising new class of materials for SPR-based sensors. They offer a number of advantages over traditional materials, including high sensitivity, small size, and high stability. This makes them ideal for a wide range of applications, including biosensing, chemical sensing, and optical imaging.

As research into 2D materials continues, we can expect to see even more advances in the performance and applications of 2D material-based SPR sensors.



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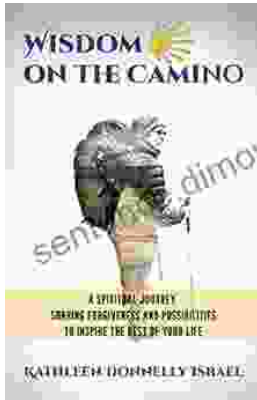
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