Xie, Z., Raju, M. V. R., Stewart, A. C., Nantz, M. H., & Fu, X. A. (2018). Imparting sensitivity and selectivity to a gold nanoparticle chemiresistor through thiol monolayer functionalization for sensing acetone. *RSC advances*, *8*(62), 35618-35624. https://doi.org/10.1039/C8RA06137H

Definitions

- **Gold nanoparticle chemiresistor**: A sensor made of tiny gold particles that changes its electrical resistance when it detects certain chemicals.
- **Thiol monolayer functionalization**: A process where a single layer of molecules containing sulfur is attached to a surface to give it specific properties.
- **Acetone**: A colorless, flammable liquid often used as a solvent and found in nail polish remover.

Key Findings

- The gold nanoparticle chemiresistor with thiol monolayer is very good at detecting acetone.
- The sensor's sensitivity and selectivity are improved through this functionalization process.

Introduction

The study focuses on improving sensors that can detect acetone. This is important because acetone is used in many industries and needs to be monitored for safety and quality control.

Main Content

Background

Gold nanoparticles are used in sensors because of their unique properties. However, making these sensors sensitive and selective to specific chemicals like acetone is challenging.

Methods

- **Functionalization Process**:
    - Attached thiol molecules to gold nanoparticles to create a monolayer.
    - Tested different types of thiol molecules to see which worked best.
- **Testing Sensitivity**:
    - Measured how the sensor's resistance changed when exposed to different amounts of acetone.
- **Testing Selectivity**:
    - Tested the sensor with other chemicals to ensure it specifically detected acetone.

Results

- **Sensitivity**:
    - The sensor detected even very low levels of acetone.
    - The thiol monolayer significantly increased sensitivity.
- **Selectivity**:
    - The sensor was able to distinguish acetone from other similar chemicals.
    - Certain thiol molecules were better at making the sensor selective for acetone.

Conclusion

The study successfully developed a gold nanoparticle chemiresistor that is highly sensitive and selective for detecting acetone. This improved sensor can be used in various applications where monitoring acetone is important.

The enhanced sensitivity and selectivity achieved through thiol monolayer functionalization demonstrate the potential for creating more effective chemical sensors using this approach.

Word Count: 301