

Designing and Testing Chemical Sensors

Part 1: Dialogue

Context: A Chemical Engineer who is designing and testing chemical sensors for industrial and medical applications with a colleague.

Characters:

- **Sophia:** Chemical Engineer
 - **Ethan:** Research Scientist
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Sophia: Ethan, I need your input on optimizing the sensitivity of our chemical sensors for industrial applications.

Ethan: Sure! Have you tested different techniques in **analytical chemistry** to improve detection accuracy?

Sophia: Yes, but I'm still fine-tuning the parameters. I'm considering using **spectroscopy** for more precise chemical identification.

Ethan: That's a great idea. Have you also looked into **gas chromatography** for separating complex mixtures before detection?

Sophia: I have. It could enhance selectivity, but we need to ensure real-time performance for medical applications.

Ethan: Good point. For medical use, **pH measurement** accuracy is critical, especially in biosensors for blood analysis.

Sophia: Exactly. I'm also testing **electrochemical sensing** for quick and reliable detection of contaminants.

Ethan: That makes sense. Electrochemical methods could be ideal for real-time monitoring in both industrial and medical fields.

Sophia: Agreed. Let's run additional tests and compare sensor efficiency across different detection methods.

Ethan: Sounds good. Once we have the data, we can refine the design and move to prototype development.

Part 2: Comprehension Questions

1. What is Sophia trying to optimize in the chemical sensors?
 - (A) The size of the sensors
 - (B) The manufacturing cost
 - (C) The sensitivity for industrial applications
 - (D) The color of the sensors
2. Why does Ethan suggest using **gas chromatography**?
 - (A) To speed up the chemical reaction
 - (B) To separate complex mixtures before detection
 - (C) To change the structure of the sensor
 - (D) To reduce the number of required tests
3. What aspect of medical sensors does Sophia emphasize?
 - (A) Real-time performance
 - (B) Cost reduction
 - (C) Compatibility with industrial equipment
 - (D) The ability to change colors when exposed to chemicals
4. What will they do next to improve the sensors?
 - (A) Discard the project due to low demand
 - (B) Change the sensors to use mechanical detection instead
 - (C) Stop testing and begin mass production immediately
 - (D) Run additional tests and compare sensor efficiency

Part 3: Vocabulary Definitions

1. **Analytical chemistry** – 分析化学（物質の成分や構造を分析する科学）
2. **Spectroscopy** – 分光法（光を使って物質の特性を分析する手法）
3. **Gas chromatography** – ガスクロマトグラフィー（気体を使って混合物を分離する分析手法）
4. **pH measurement** – pH 測定（物質の酸性・アルカリ性を測定する方法）
5. **Electrochemical sensing** – 電気化学センサー（化学物質の検出に電気的な方法を用いる技術）

Part 4: Answer Key

1. **What is Sophia trying to optimize in the chemical sensors?**
 (C) The sensitivity for industrial applications
2. **Why does Ethan suggest using gas chromatography?**
 (B) To separate complex mixtures before detection
3. **What aspect of medical sensors does Sophia emphasize?**
 (A) Real-time performance
4. **What will they do next to improve the sensors?**
 (D) Run additional tests and compare sensor efficiency