# Using Properties to Identify Materials

*Forensic chemists test the physical and chemical properties of materials found at a crime scene. They also do similar tests on the materials found on a suspect's skin or clothing. These materials are often complex mixtures, such as soil, which contain many substances. In this lab, you will compare the properties of three known materials with two samples of "evidence." These samples represent evidence from a crime scene and evidence from a suspect's shoe. Although your materials and equipment are less complex than those used by forensic chemists, your overall method will be similar to the methods they use.*

**Problem** Can the properties of materials that appear similar be used to tell them apart?

## Materials

- 2 spot plates
- glass-marking pencil
- 5 laboratory spatulas
- cornstarch
- baking soda
- baking powder
- wash bottle of water
- vinegar
- iodine solution
- sample from crime scene
- sample from suspect's shoe

**Skills** Observing, Inferring, Predicting

## Procedure

**Part A: Properties of Known Substances**

1. Use a glass-marking pencil to label 15 wells A through O on the spot plates. Make a mark next to each well, not in the well.
2. Use a spatula to place a small amount of cornstarch in wells A, B, and C. In the data table, record any physical properties of the cornstarch that you observe.

**DATA TABLE**

| Sample | Description | Result of Adding Water | Result of Adding Vinegar | Result of Adding Iodine |
|---|---|---|---|---|
| Cornstarch | | | | |
| Baking soda | | | | |
| Baking powder | | | | |
| Crime scene sample | | | | |
| Sample from suspect's shoe | | | | |

3. Use a clean spatula to place a small amount of baking soda in wells D, E, and F. Record any physical properties of baking soda that you observe.
4. Using a clean spatula, place a small amount of baking powder in wells G, H, and I. Record any physical properties of baking powder that you observe.

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5. Fill wells A, D, and G with water. Record any observed changes.
6. Fill wells, B, E, and H with vinegar. Record any observed changes.
7. Add one drop of iodine solution to wells C, F, and I. Record any changes that you observe. **CAUTION:** *Iodine solution is corrosive and poisonous. It can stain skin and clothing. Rinse any iodine spills with water.*

**Part B: Properties of Unknown Substances**

8. **Predicting** Look at the sample from the crime scene and the sample from the suspect's shoe. Based on your observations, predict whether testing will show that the samples are identical.

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9. Use a clean spatula to place a small amount of the sample from the crime scene in wells J, K, and L. In the data table, record any physical properties of the sample that you observe.
10. Use a clean laboratory spatula to place a small amount of the sample from the suspect's shoe in wells M, N, and O. In the data table, record any physical properties of the sample that you observe.
11. Fill wells J and M with water. In the data table, record your observations.
12. Fill wells K and N with vinegar. In the data table, record your observations.
13. Add 1 drop of iodine solution to wells L and O. In the data table, record your observations.
14. Rinse all materials off the spot plates and flush them down the drain with at least ten times as much water. Dispose of your plastic gloves as directed by your teacher. **CAUTION:** *Wash your hands thoroughly with soap or detergent before leaving the laboratory.*

## Analyze and Conclude

1. **Analyzing Data** Were you able to use the ability to dissolve in water to distinguish all three materials? Explain your answer.

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2. **Drawing Conclusions** Are the samples from the suspect's shoe and from the crime scene identical?

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3. **Evaluating and Revising** Did the data you collected support your prediction? Explain your answer.

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