The Counterfeit Money Test

The Action
Demonstrates how paper soaked in pure isopropyl alcohol will burn, but paper soaked in a solution of alcohol and water will not.

Grade Level
Grade 6 - Chemicals and Reactions
Grade 7 - Temperature and Heat
Grade 8 - Solutions
Grade 9 - Chemistry and you
Grade 10 - Physical Change and Chemical Change

Materials
- 150 mL of 70% v/v isopropyl alcohol
- 50 mL of H2O
- 2 beakers (250 mL)
- One real and one photocopied or "counterfeit" paper bill
- Tongs
- Matches

Instructions
- In one beaker, prepare a solution with 50 mL of isopropyl alcohol and 50 mL of water. Use the other beaker for the remaining 100 mL of isopropyl alcohol. Soak the real money in the beaker containing the alcohol and water solution and the "counterfeit money" in the beaker containing only isopropyl alcohol.
- Remove the counterfeit money from the beaker, allow the excess alcohol to drip off and then ignite the bill. Do the same thing with the real money. The counterfeit money will burn whereas the real money will not.

Safety
Use care when igniting the money. Safety glasses may be worn. It is recommended to have a bucket of water or perform the experiment near a sink in case the burning money falls from the tongs.

Hints
- Salt can be added to the isopropyl alcohol - water solution to give the flame some colour.
- The real currency should be unaffected but it is advised to try to experiment using other paper first to make sure that the solution will behave in the expected manner. If the v/v of the alcohol is different, alterations in the amounts of alcohol and water may need to be made to ensure that the paper will light but at the same time not burn. If the paper won't light, add more alcohol. If the paper burns, add more water.

Science Principle
The volatile alcohol burns off first in both cases. Where there is just the alcohol, the temperature increases to the paper's combustion temperature (232oC). This causes the paper to ignite once the alcohol has burned off. For the alcohol and water solution, the alcohol burns off but with the water component, the paper absorbs the water. The water absorbs enough heat to prevent the paper from reaching combustion temperature.